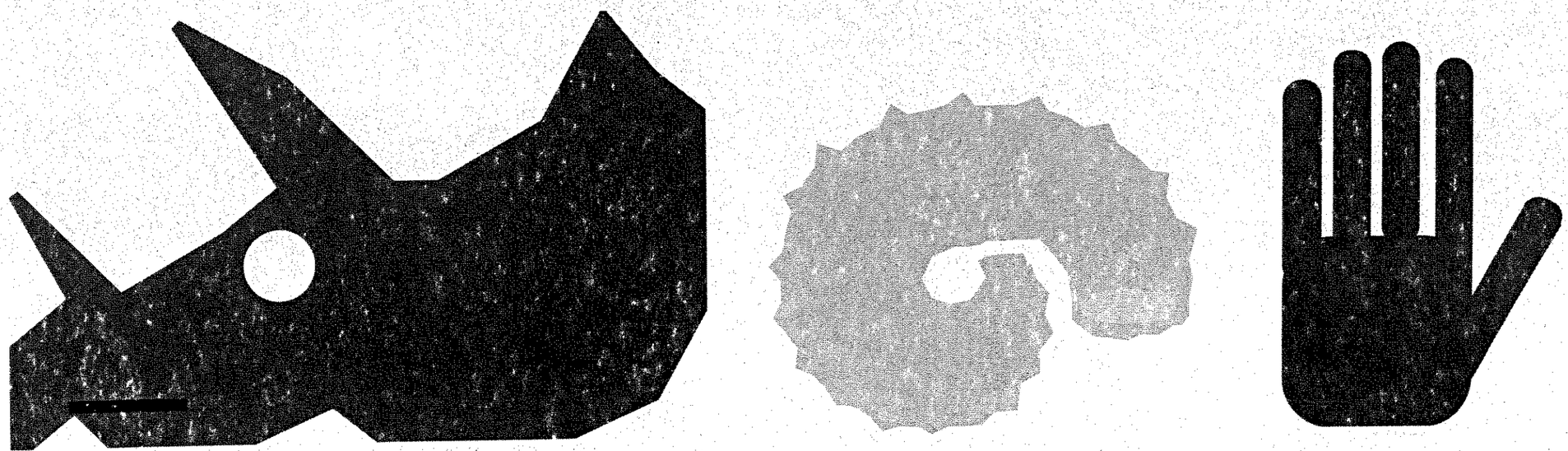
Makoshika State Park

Visitor Center

Interpretive Design Plan



Final version submitted October 31, 1992 by Beth D. Merrick, 2445 Outlaw Drive, Belgrade, Montana 59714

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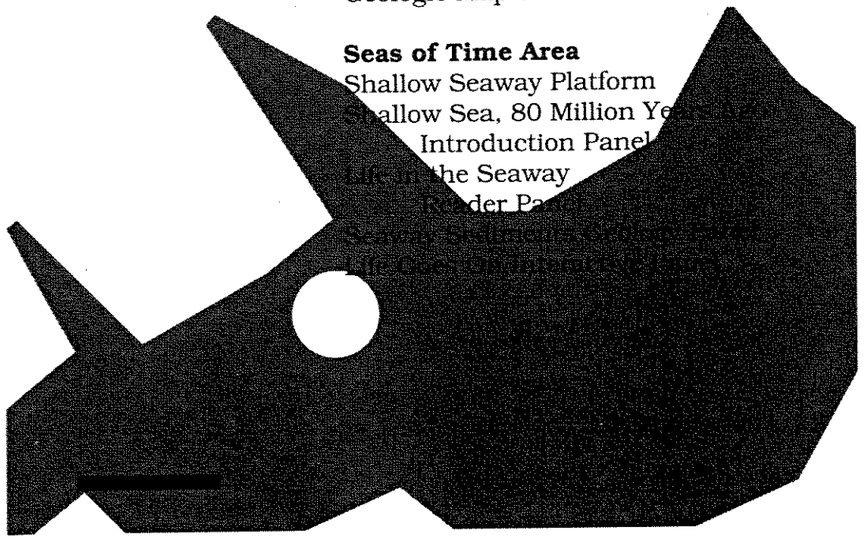
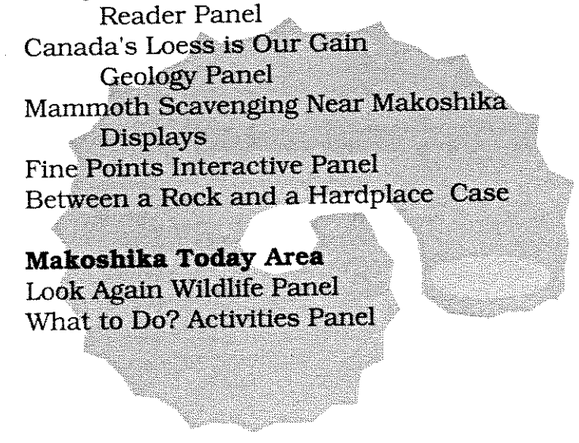
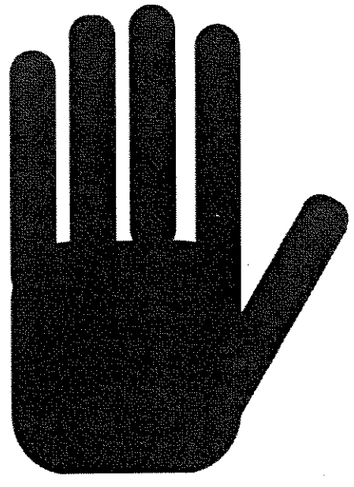






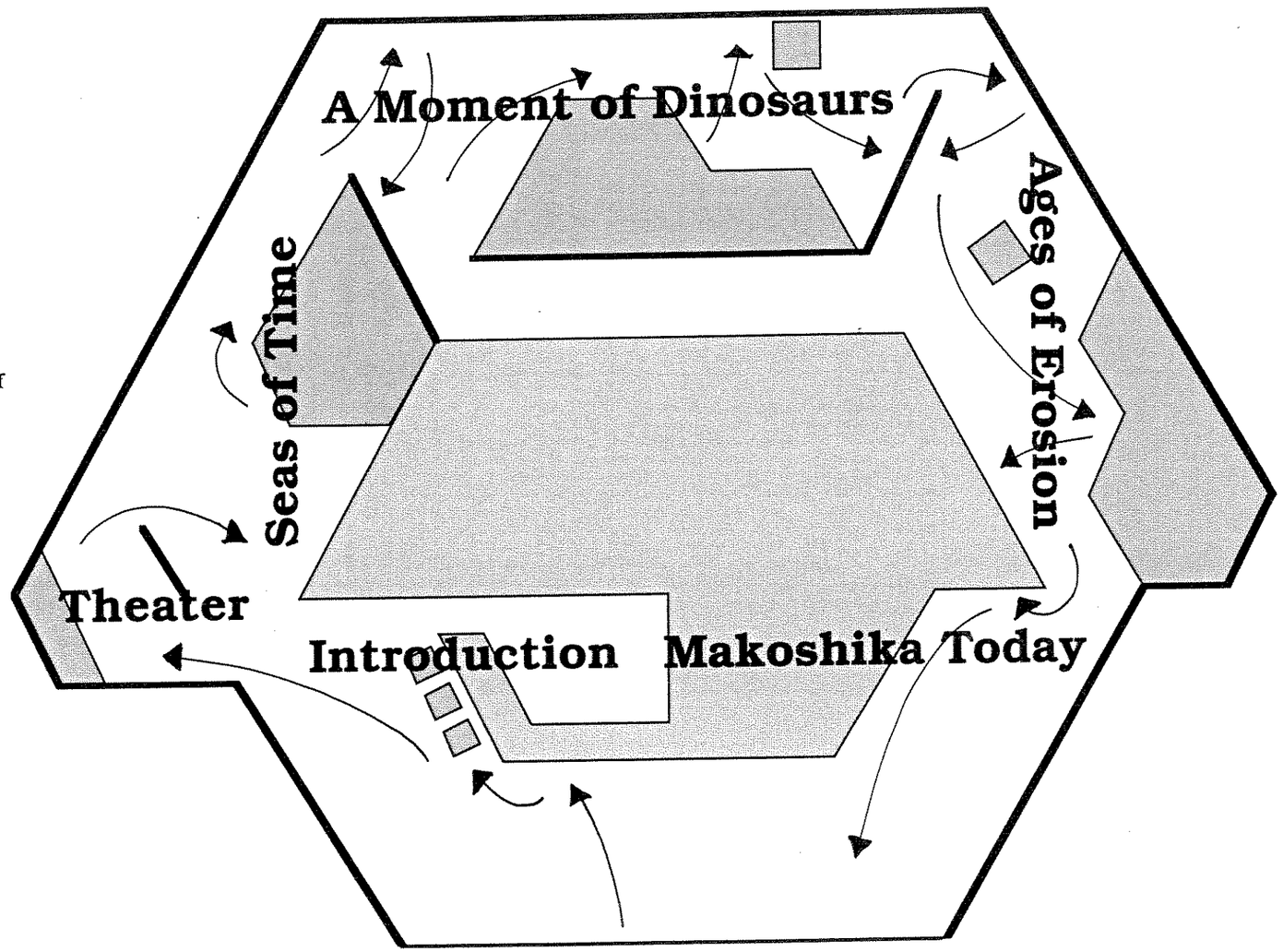
Visitor Circulation

Suggested welcome message to visitors from personnel
Welcome to Makoshika State Park.

There are lots of activities to enjoy, as well as an exhibit on the prehistory of this region.

(At the Sediment Column Sculptures)
Makoshika has been a sea floor, a swampish seashore where dinosaurs roamed, and a steppe where early people hunted mammoth and bison 11,000 years ago.

A short film will give you an overview of Makoshika and the exhibits, just beyond, are self guided.



Visitors enter the Makoshika Visitor Center and are greeted at the entry desk. It is here that a short introduction to the exhibit theme takes place adjacent to the *Makoshika: Same Place-Different Faces* panel and the Sediment Columns. In the theater area, park visitors enjoy a short overview audio visual program on the Park's prehistory. At their own pace, visitors move through these exhibit areas in order:

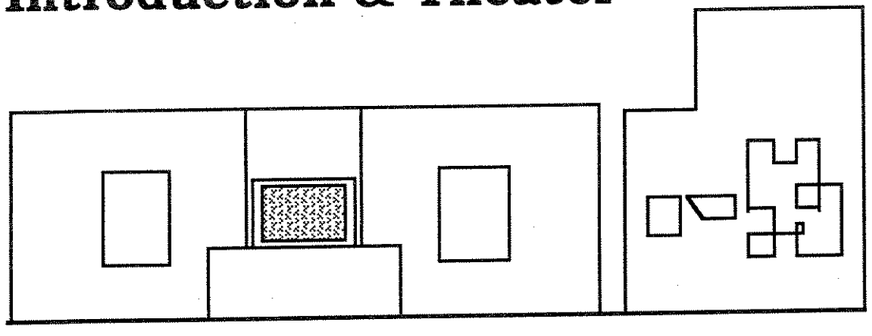
Seas of Time
A Moment of Dinosaurs
Ages of Erosion

The Makoshika Today area at the exit provides information on Park services and activities at the conclusion.

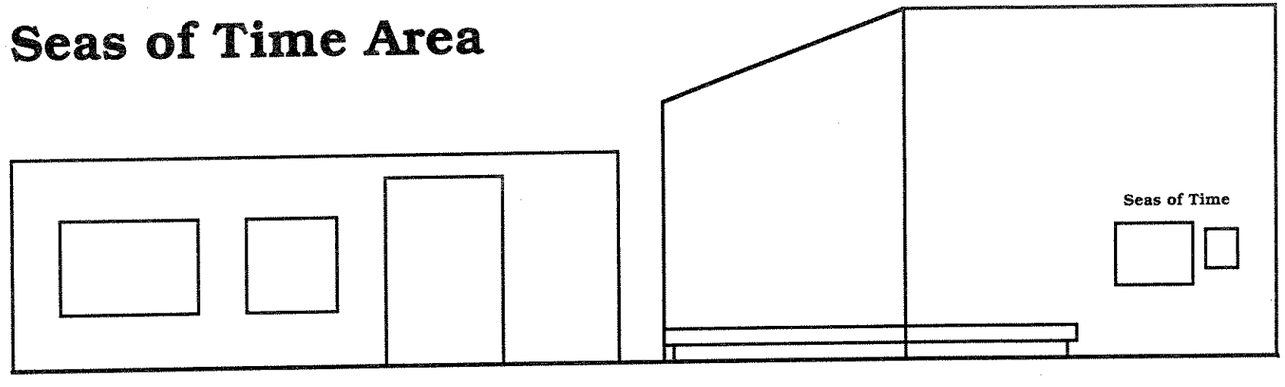
Exhibits:
Displays are self-contained and inclusive, so that visitors may move randomly through the space to elements that intrigue them without missing important information.

Exhibition Areas

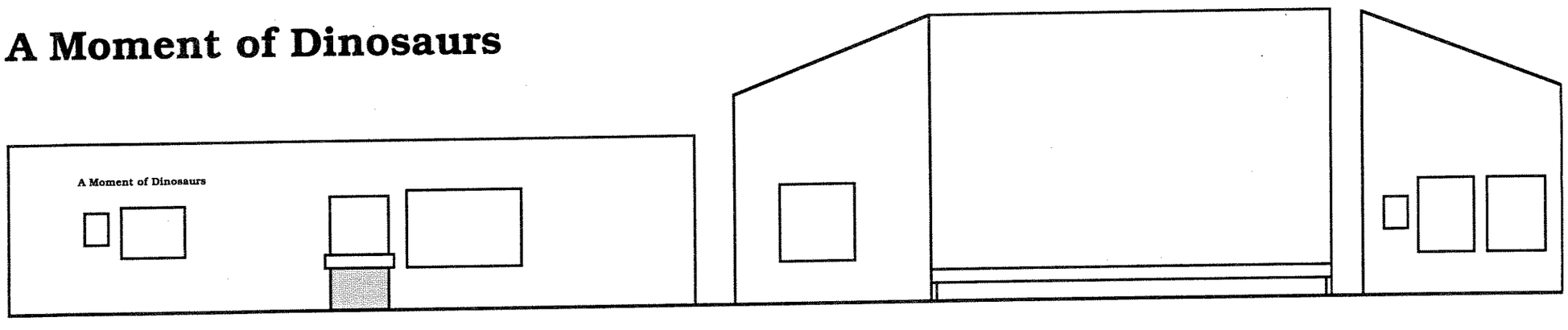
Introduction & Theater



Seas of Time Area

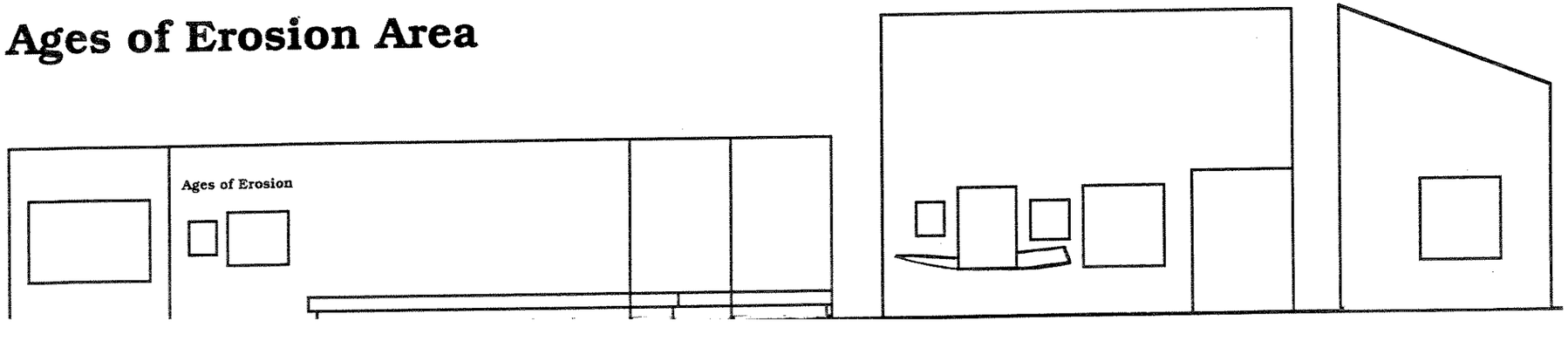


A Moment of Dinosaurs

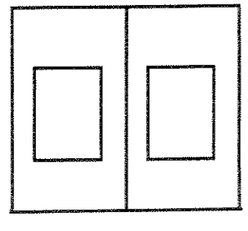


Scale: 1 inch = 10 feet

Ages of Erosion Area

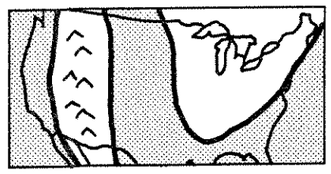


Makoshika Today



Makoshika: Same Place-Different Faces

North America
80 million years ago



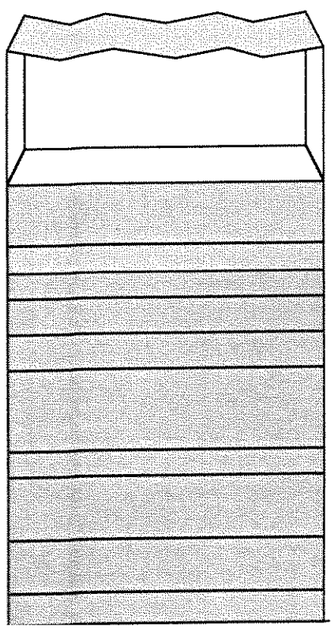
Regional Seaway
65 million years ago

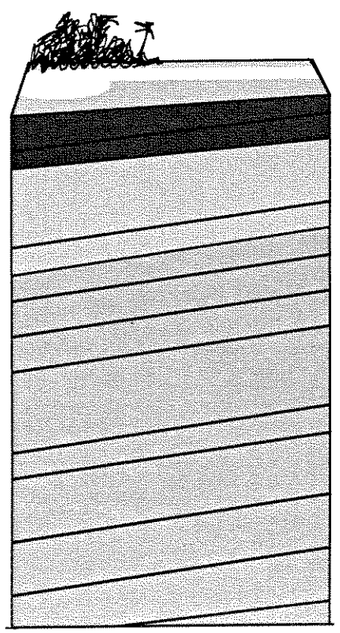
North America
11,000 years ago

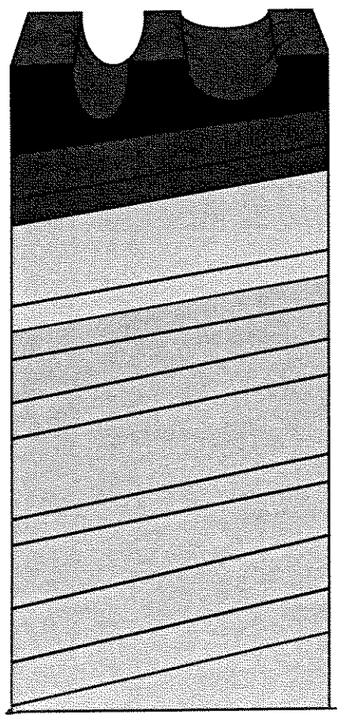
Seas of Time:
A Shallow Sea
A block of polyurethane plastic symbolizes the Late Cretaceous Seaway that caps the Colorado Group sediments.

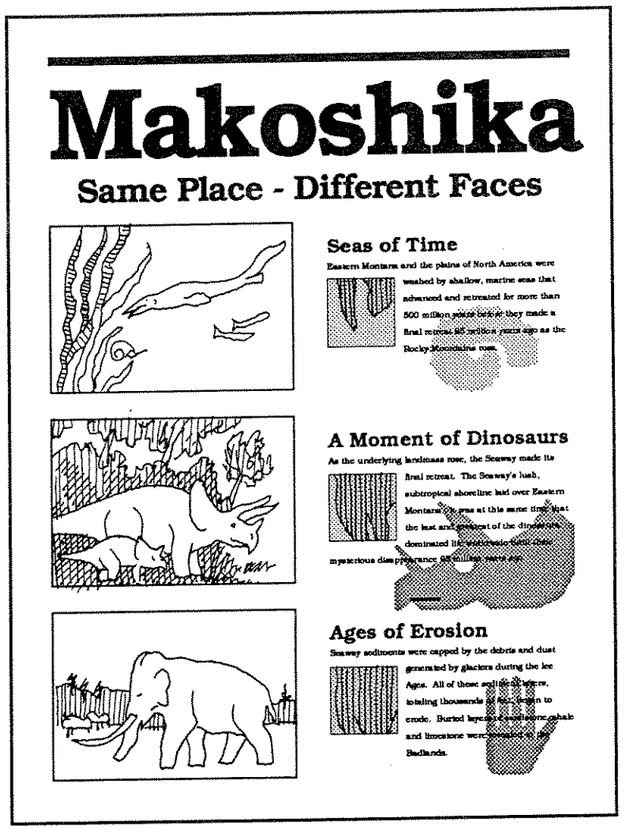
A Moment of Dinosaurs:
A Subtropical Seashore
A sculpted fiberglass surface depicts the lush vegetation and braided streams of the subtropical seashore of the Late Cretaceous. The underlying Hell Creek sediments and lower layers are uplifted and deformed.

Ages of Erosion:
An Arid Badland
A sculpted fiberglass surface depicts the eroding badlands of the Pleistocene that rest on top of the Fort Union sediments. Underlying sediment layers are compressed and deformed.









Copy:
Seas of Time- Eastern Montana and the plains of North America were covered by shallow marine seas that advanced and retreated for more than 500 million years. They made their last retreat 65 million years ago as the Rocky Mountains rose.
A Moment of Dinosaurs- In geological terms, the Seaway's lush, subtropical shoreline lay over eastern Montana for only a moment. It was at this same time that the last and greatest of the dinosaurs dominated life worldwide until their mysterious disappearance 65 million years ago.
Ages of Erosion- Ice Age glaciers of Canada ground rock to fine dust. This airborne dust capped the marine and land laid sediments. Then all of these sediment layers, totaling thousands of feet, began to erode. Buried layers of sandstone, shale and limestone were revealed in the Badlands.

The three periods covered in the interpretive displays, the Seaway, Subtropical Seashore and Badlands, are introduced and illustrated on the title panel. Three free-standing sediment columns depict the 7,200 feet of sediments underlying Makoshika State Park. The top layer of each column depicts a different face of the park.

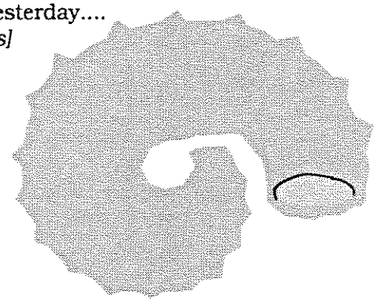
Construction:
18" deep 18" wide x 32" high columns of plywood are covered in laminate depicting marine, land and airborne sediments. The sculptures are anchored to the floor. The top-layer sculptures bolt to the top of the sediment column boxes.
A 3'x4' vertical wall panel made of laminate-covered particle board with heat-taped edges is attached to the wall with a gardner cleat. Titles, graphics and copy are silkscreened and photos are laminated to the panel under .125 inch clear plexiglass.
Photographs:
Color photo copies of Doug Henderson illustrations of Shallow Seas (80 mya), Seashore (65 mya) and Badlands (11,000 years ago).

Audio Visual Program

A button-activated laser disk program combines animation, still images and video to provide an overview of Makoshika State Park and the exhibits ahead. Life through time, as well as the geological processes that have shaped it, sedimentation, uplifting and erosion, are featured.

Script:
The Sioux Indians called this place "Makoshika" or *badlands* because, at first glance, it seems such a barren and austere place. But when you look more closely, it abounds with life. Life forms of today....
[Today's Park-views and vistas, rock formations, plants and animals]

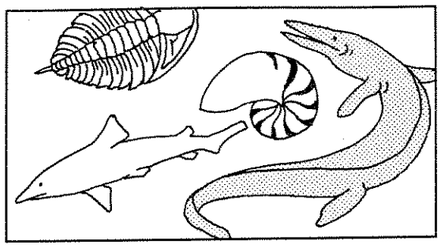
and yesterday....
[fossils]



Makoshika has not always looked as it does today. For 500 million years it was a sea floor.
[thunderstorm sequence]

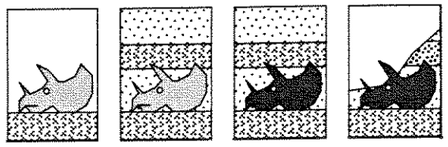
Our Earth is in a constant state of flux, caught between building up and wearing down...it's one or the other. Eroded soil isn't lost, it is just moved and deposited somewhere else. Water (glaciers, rivers) carried tiny pieces of the early continent away to be deposited as deltas and ocean bottoms at the edge of the continent. The continental shelves are covered miles deep with sediments.
[animated sequence showing the erosion of the Craton and the building of the shelf from an elevation view that moves to...]

Mountains rose and eroded. Land masses lifted and were eroded, too. For 500 million years, the interior of the continent was covered by seas that came and went many times.
[aerial view of the region which depicts the orogenies and transgressions and regressions of the Seaway]



The seas were home to the life forms of the moment: worms, trilobites and other hard-shelled life; ammonites; animals with backbones, and sea monsters. All were buried in their turn in the accumulating sediments.
[a series of life forms appears (in order of sophistication) one at a time underwater. Each is swept to the bottom of the screen to be buried in sediments: worms, trilobites, etc. (The Pierre Shale, Fox Hills, Hell Creek and Fort Union layers might be labeled and appropriately colored.)]

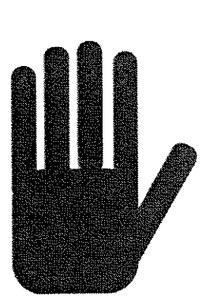
As sediments built, the buried remains, usually shells, teeth, and bones, were replaced by minerals, molecule by molecule. Buried in sediment, they waited and hardened into fossils.
Henderson hadrosaur series: under sediments



At the moment in time when the last of the Dinosaurs roamed the earth, the Seaway began its final retreat as the continent lifted. The dinosaurs enjoyed the lush, subtropical edge of the Seaway until their extinction.
[The water line recedes down the slope until it is out of the picture while dinosaurs enter from up slope and follow the retreating water line. A sudden asteroid impact clears the screen.]

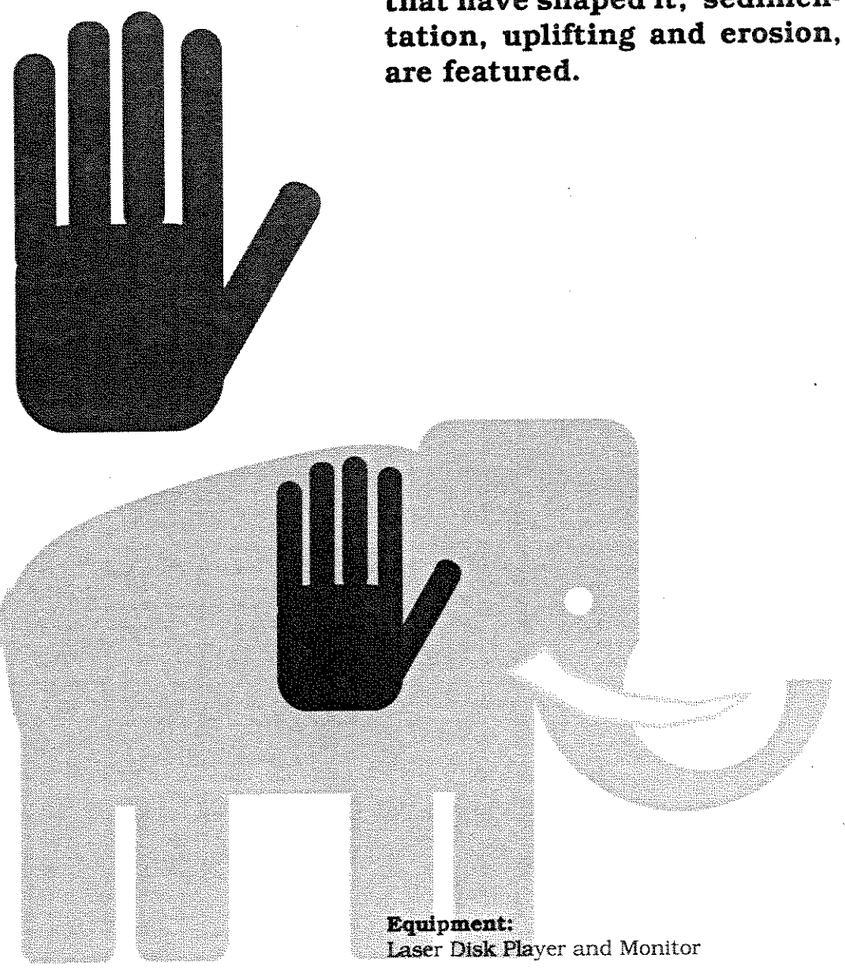
Millions of years later, glaciers to the north of the region churned rock into fine debris called loess, that was spread over the ancient Seaway's sediments by wind.
[sedimentary elevation grows yet taller and deeper]

Then the erosion began... eating away at the glacial dust called loess and the marine sandstones and shales deposited by the seas of time and beginning to sculpt the unique forms of Makoshika's badlands.
[a thunderstorm threatens, cuts to a rivulet carrying sand and pebbles downstream]



To these lands came hunter-gatherers 11,000 years ago. Pursuing the giant bison and mammoths that inhabited this land, these early people adapted to the shifting game populations.
[Imperial and Columbian mammoth, camel, Pleistocene horse and bison are replaced by deer, bison, mountain sheep, rabbits, porcupine and wolves.

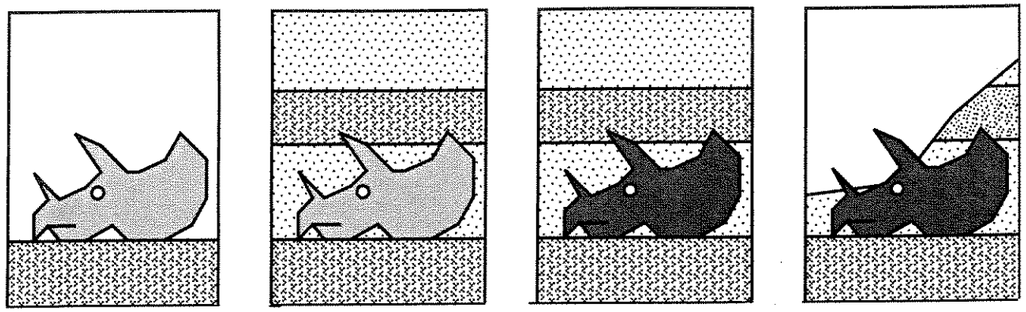
Erosion continues today...changing the landscape and revealing the history of life of earlier times buried within the sedimentary layers of Makoshika State Park.
[another thunderstorm, this one focuses on an eroding slope where a fossil is being revealed by the downpour]



Equipment:
Laser Disk Player and Monitor

Fossils

A variety of types of fossils, along with illustrations of the fossilization process, introduce visitors to the buried treasure of life in the park.



Fossilization Process

1 An animal dies; its flesh usually rots away before being buried in sediments.

2 The weight of millions of years of sediment build-up applies great pressure.

3 Organic molecules are replaced with minerals as fossilization occurs.

4 Erosion gradually cuts away the overlying sediment layers, eventually revealing the fossil.

Copy:

Evidence of Past Life
Fossils are the tangible remains of past life. Buried for thousands or millions of years, the hard parts of ancient life like teeth, bones or shells are gradually replaced by minerals as life literally turns to stone.

Types of Fossils

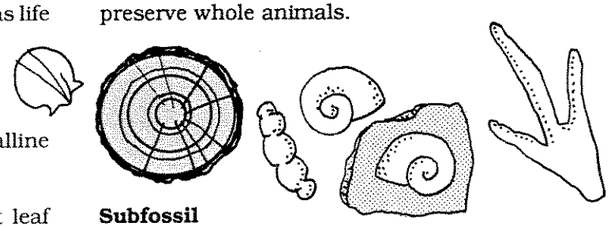
Replacement
Plants are commonly replaced with crystalline quartz creating petrified wood.

Carbonization
The carbon that makes up a living plant leaf occasionally remains after it's burial, leaving a "carbon copy" in rock.

Molds and Casts
Percolating water sometimes creates an empty mold as the organic elements are dissolved and washed away. Occasionally minerals will collect in the mold and create a rock cast.

Trace Fossils
Preserved tracks or burrows made by animals provide evidence of past life.

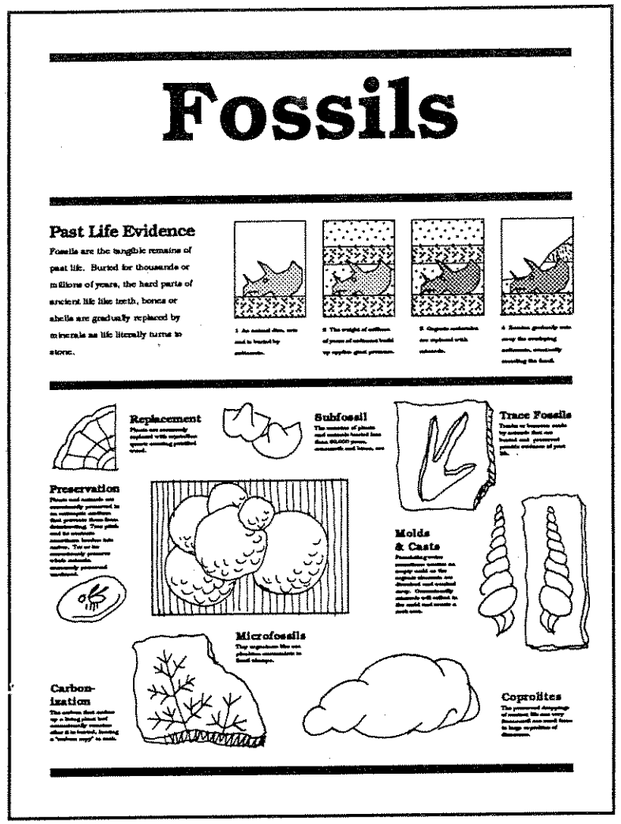
Preservation
Plants and animals are occasionally preserved in an antiseptic medium that prevents them from deteriorating. Tree pitch and its contents sometimes harden into amber. Tar or ice occasionally preserve whole animals.



Subfossil
The remains of plants and animals buried less than 60,000 years (like mammoth and bison) commonly remain with little alteration.

Microfossils
Tiny organisms like sea plankton accumulate in fossil clumps.

Coprolites
The preserved fecal droppings of ancient life can vary from small sea snail feces to the large coprolites of dinosaurs.



Construction:
A 3'x4' vertical wall panel made of laminate-covered particle board is attached to the wall with a gardner cleat. Titles, graphics and copy are silkscreened and photos and fossils are attached. A plexiglass box covers the entire panel and attaches with security screws around the perimeter.

Photographs:
A blow up photograph of a micro fossil

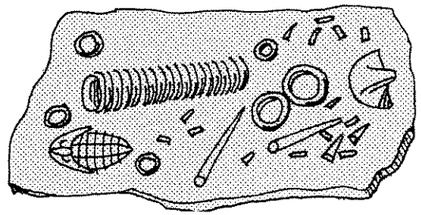
Illustrations:
Serial images of a Triceratops being fossilized

Objects:
Fossils for each of the fossil types

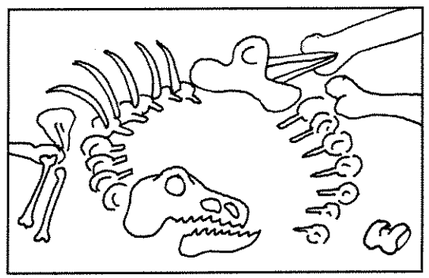
Evidence

A variety of types of fossils and artifacts, along with illustrations and photographs indicate how other kinds of evidence give scientists an understanding of past life.

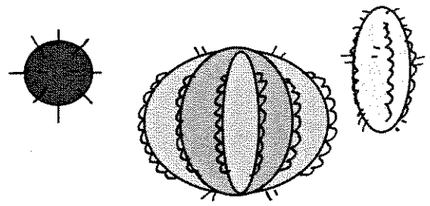
Copy:
Other Evidence
The circumstances in which traces of life are found provide additional evidence of how organisms lived and died.



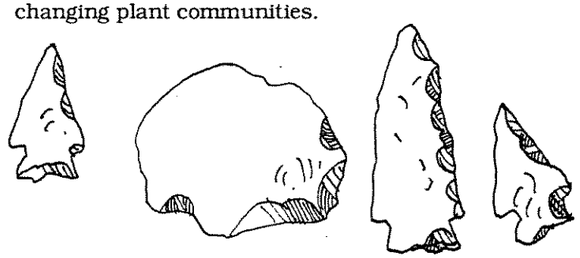
Assemblages
A variety of members of a community are occasionally buried together, forever preserving their association with one another.



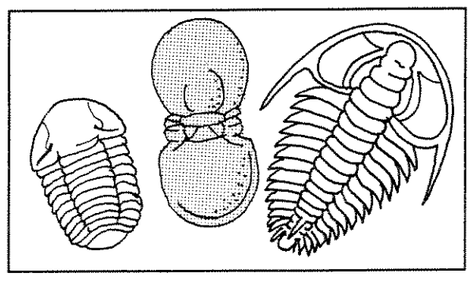
Taphonomy
The study of the processes of decay and fossilization helps scientists to understand the circumstances that surround an animal's death and preservation. Volcanic ash layers provide evidence for determining the cause of death of a herd of dinosaurs.



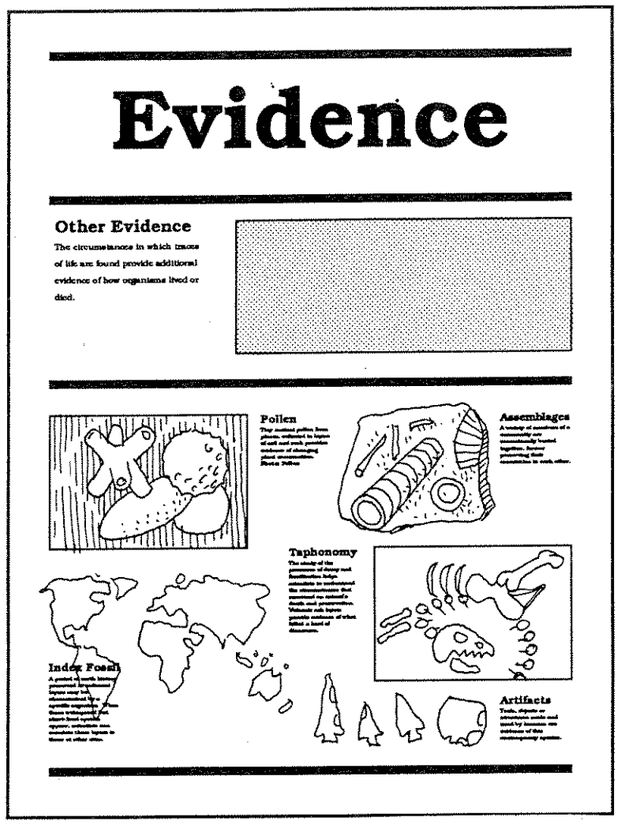
Pollen
Tiny ancient pollen from plants, collected in layers of soil and rock, provides evidence of changing plant communities.



Artifacts
Tools, objects or structures made and used by humans are evidence of a contemporary species. Because paleontology is the study of ancient life, humans and their artifacts are not considered fossils.



Index Fossil
A period of earth history preserved in sediment layers may be characterized by a specific creature. When these widespread but short-lived species appear, scientists can correlate these layers to those at other sites.



Construction:
A 3'x4' vertical wall panel made of laminate-covered particle board is attached to the wall with a gardner cleat. Titles, graphics and copy are silkscreened and photos and fossils are attached. A plexiglass box covers the entire panel and attaches with security screws around the perimeter.
Photographs:
A photo of pollen grains, triceratops and mammoth
Illustrations:
Distribution Map of Index Fossil and Diagram of Excavation
Objects:
Faunal Assemblage Fossil, Clovis Points, Makoshika Index Fossil, Trilobite

Park Topo Map & Geologic Map of Montana

Copy:
A Big Bulge
Cedar Creek Anticline
Makoshika State Park lies at the northwestern edge of the Cedar Creek Anticline, a 30 mile wide by 150 mile long area of uplifted layered rocks. The earth's internal forces applied pressure to this section of rocks from time to time between 400 and 50 million years ago, causing them to buckle and bulge upward. Erosion has revealed the older underlying layers at the center of this fold.

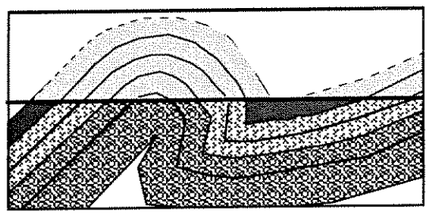
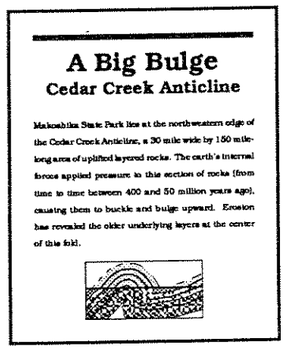
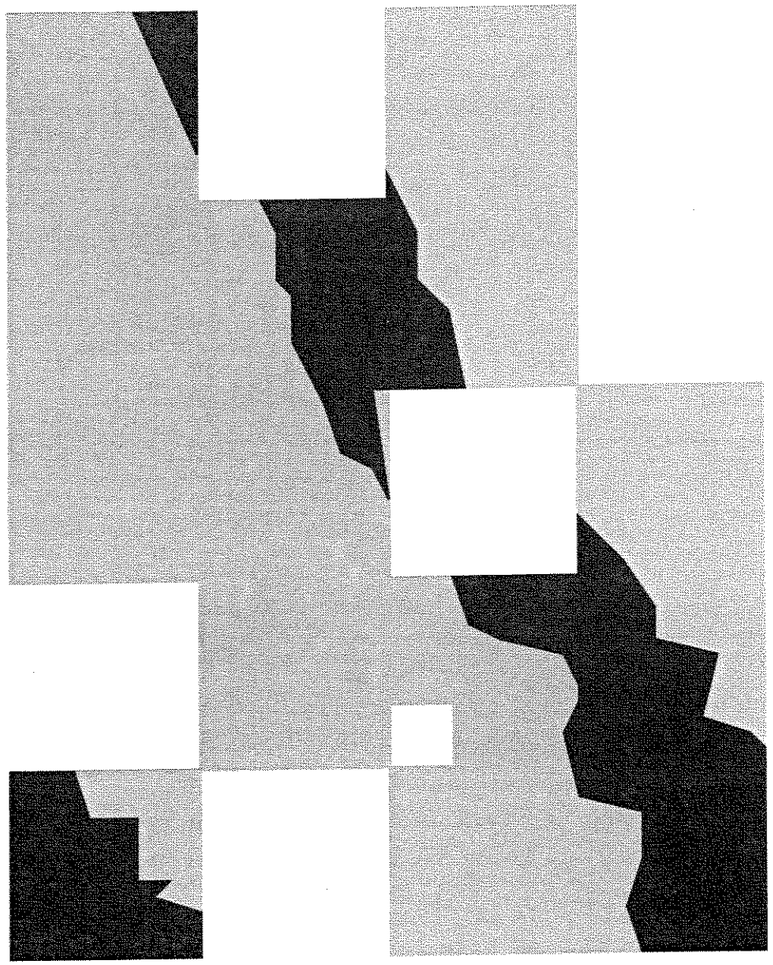


Diagram Copy:
Airborne Layers in the Park
Loess Wind-blown glacial dust
Landlaid Layers Visible in the Park
Fort Union Marshes, alluvial plains, stream channels
Hell Creek Stream channels, alluvial plains
Underlying Sea Layers in the Park
Fox Hills Ocean-laid beach and delta sediments
Pierre Shale Ocean-laid sediments





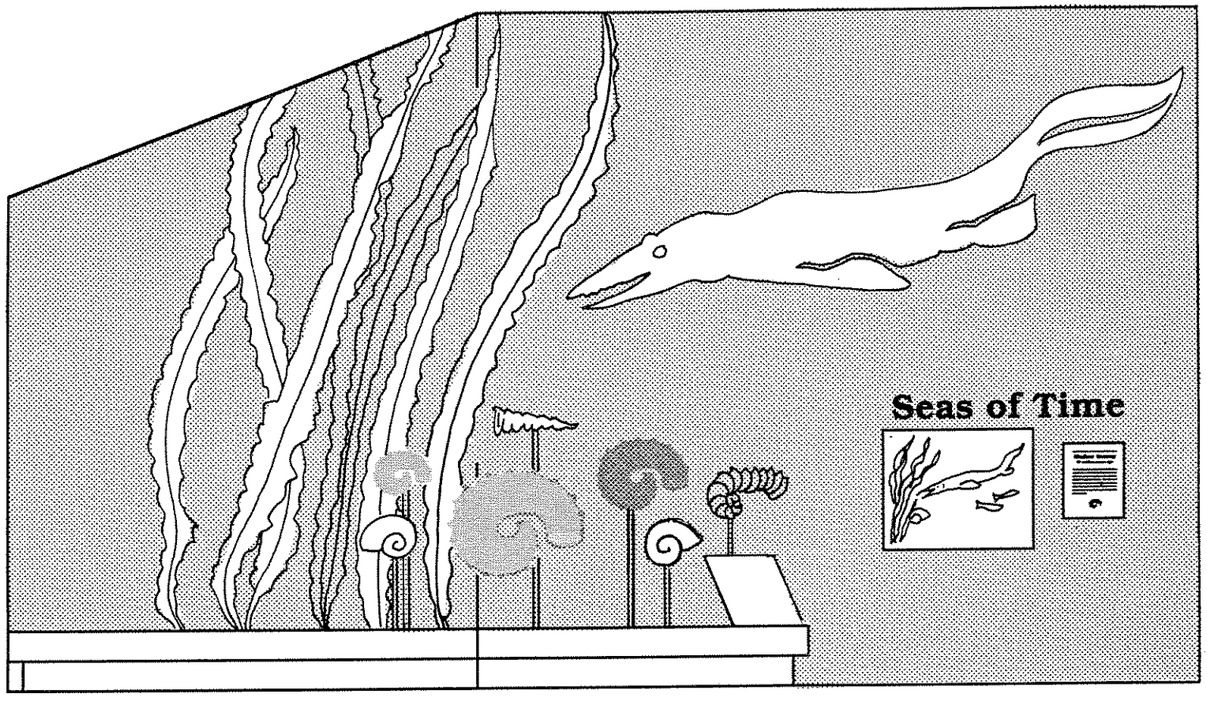
Makoshika's geology is shaped by its proximity to the Rocky Mountains, which are depicted in a state map showing the state's current exposed rock surfaces.
The visible sediment layers found within the park are evident in a color-coded topographic map that corresponds to sediments found in the exhibits.

Construction:
A 16" x 20" vertical wall panel made of laminate-covered masonite and backed with a spacer is attached to the wall with a gardner cleat. Titles, graphics and copy are silkscreened.
Topographic Maps:
4'-9"x6' vertical, topographic park map with color differentiating sediment layers
2'-4"x1'-3" horizontal cut out polychromed geologic map of Montana
Illustrations:
Diagram of Cedar Creek Anticline layers

Seas of Time

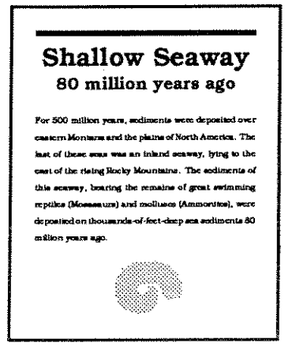
Copy:
Shallow Sea, 80 Million Years Ago
For 500 million years, sediments were deposited over eastern Montana and the plains of North America. The last of these seas was an inland seaway, lying to the east of the rising Rocky Mountains. The sediments of this seaway, bearing the remains of great swimming reptiles (mosasaurs) and molluscs (ammonites), were deposited on thousands-of-feet-deep sea sediments 80 million years ago.

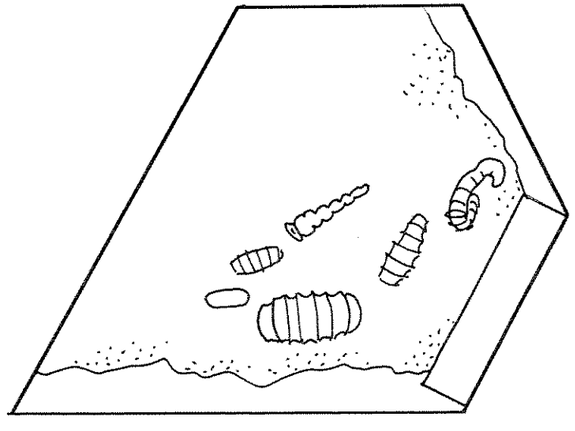
* Doug Henderson is a Montana artist who has illustrated many dinosaur and landscape books. His artwork can be available to the Park under a variety of terms:
1 The Park can own the artwork with all publication rights (cheap)
2 The Park can commission new pieces for one-time usage (cheaper)
3 The Park can purchase a one-time usage from existing artwork (cheapest)



An underwater scene with mosasaur and ammonite silhouettes on the wall and stage-set algae create the atmosphere of an ancient seaway of 80 million years ago. Ammonite fossils appear to float in the water supported on rods above a platform.

A pastel illustration by Doug Henderson* provides a detailed view of an ancient world. A panel provides a description of the scene.


Shallow Seaway
80 million years ago
For 500 million years, sediments were deposited over eastern Montana and the plains of North America. The last of these seas was an inland seaway, lying to the east of the rising Rocky Mountains. The sediments of this seaway, bearing the remains of great swimming reptiles (Mosasaurs) and molluscs (Ammonites), were deposited on thousands-of-feet-deep sea sediments 80 million years ago.



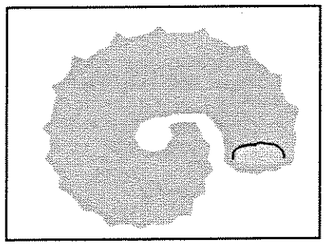
Area Signing:
Seas of Time
6" tall vinyl lettering applied to wall
Atmosphere:
interpretive nylon algae extend from platform to ceiling
Illustrations:
Seaway color field with life-sized silhouette of mosasaur and ammonites
Framed Doug Henderson pastel art measuring 2'-6"x3'-4" of a Mosasaur attack on ammonites with blue green algae circa 80 mya
Ammonite
Objects:
Ammonites
Construction:
A platform riser provides support for a reader panel and protects fossils. The riser is 18" high and covered with rock to discourage visitors from stepping on to it. Electrical outlets and vents are hidden under the platform overhang.
A 16"x20" vertical wall panel made of laminate-covered masonite and backed with a spacer is attached to the wall with a gardner cleat. Titles, graphics and copy are silkscreened.

Life of the Seaway

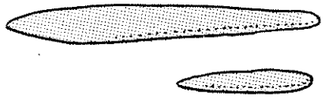
A panel with fossils and graphics on ammonites and mosasaurs illustrates that life and death struggles have gone on for millions of years. These predators and prey also demonstrate a close kinship with modern animals.

Copy:

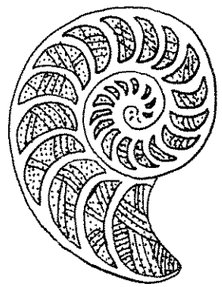
Cephalopods
Cephalopods are an ancient and diverse group of mollusks that have inhabited seas for 500 million years. As cephalopods grow, they secrete more shell and move into the new section, building a wall behind. The walled-off chambers provide buoyancy, since a tube connecting them allows air to be pumped into the abandoned sections.



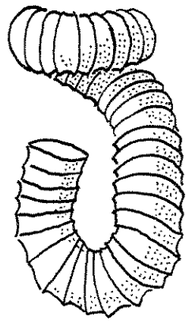
Coleoidea
Ancient *Belemnites* are related to modern squids and octopi. They all have a bullet-like guard that serves as an internal skeleton.

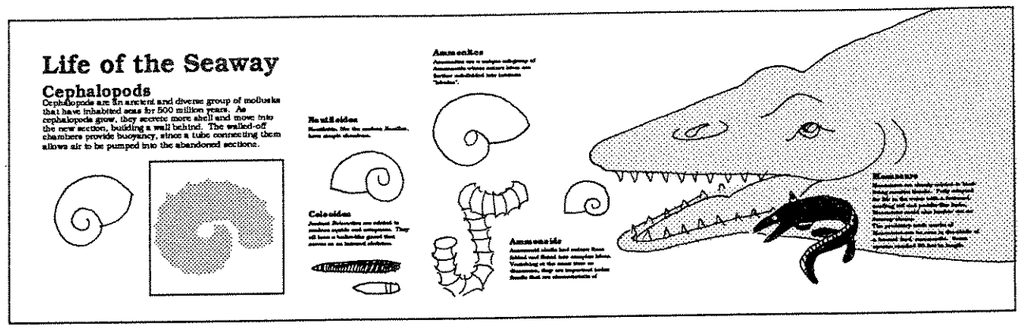


Nautiloidea
Nautiloids, like the modern *Nautilus*, have simple chambers.

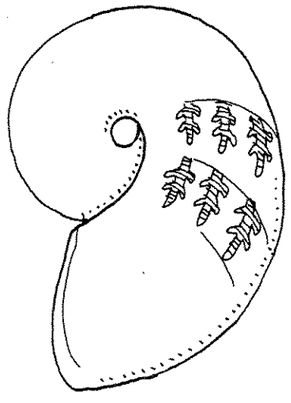


Ammonoids
Ammonoid shells had suture lines folded and fluted into complex lobes. Vanishing at the same time as dinosaurs, they are important index fossils that are characteristic of particular strata of sediments. Ornamentation distinguishes individual species.

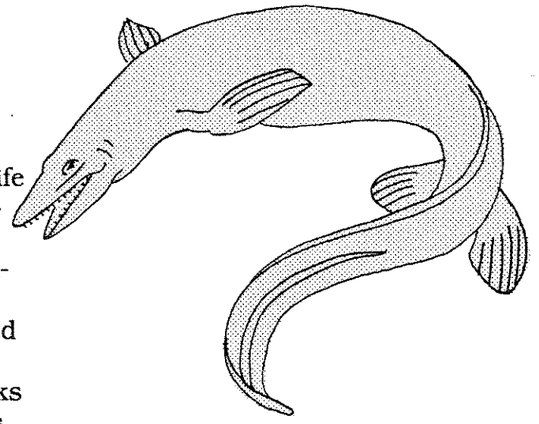




Ammonites
Ammonites are a unique subgroup of Ammonoids whose suture lobes are further subdivided into intricate "lobules."



Mosasaurs
Mosasaurs are closely related to land-living monitor lizards. They were fully adapted for life in the water with a flattened, sculling tail and paddle-like limbs. Measuring up to 30 feet in length, mosasaurs could lumber out on Seaway shores. The tooth marks of predatory Mosasaurs can be seen in the shells of a favored food, ammonoids.



Construction:
A 16"x5' inclined reader panel made of laminate-covered particle board attaches to the platform with metal supports. Titles, graphics and copy are silkscreened. Objects are attached and protected by a plexiglass box covering the entire panel and secured with security screws.

Photographs:
a living modern nautilus

Illustrations:
Graphic of mosasaur head with mouth open to attack
Diagram of cephalopod chambers

Objects:
belemnite fossils
nautiloid fossils
ammonoid fossils

Seaway Sediments

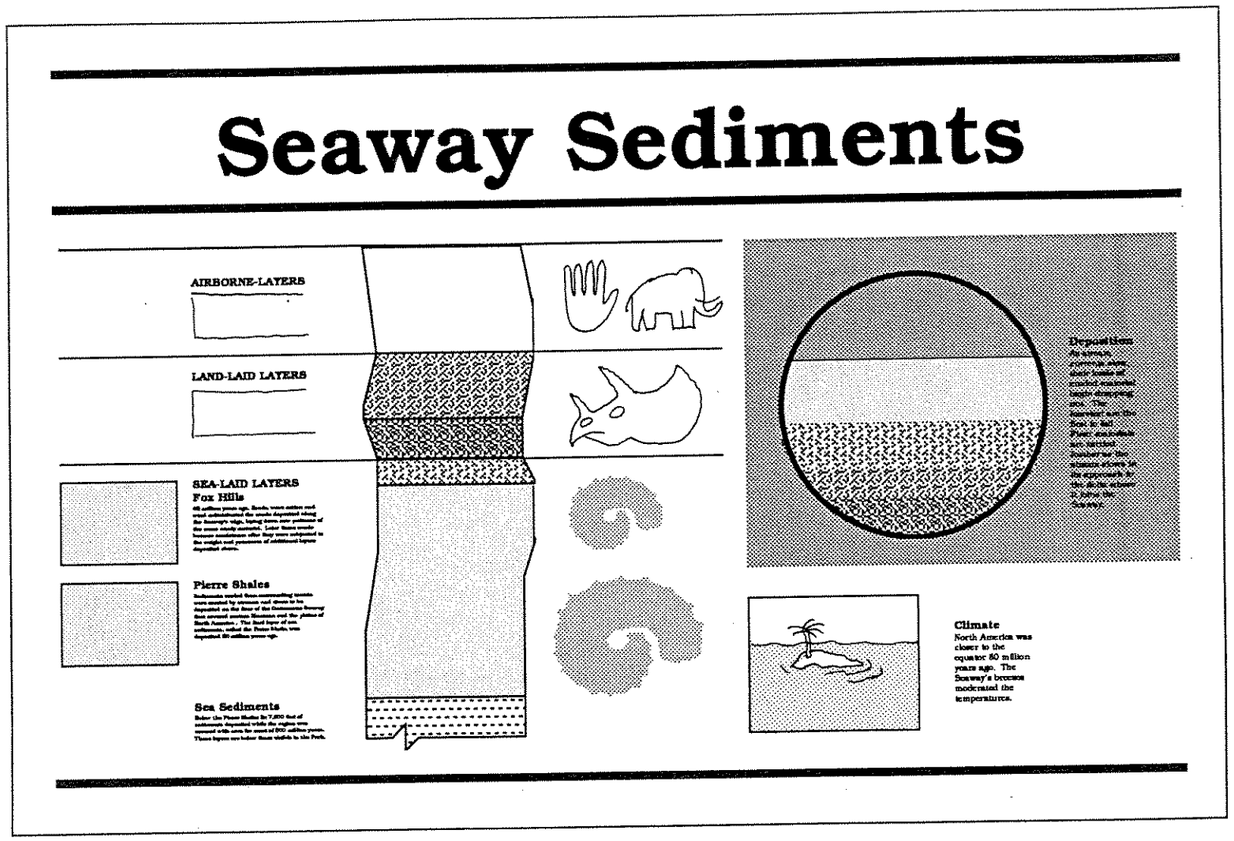
Copy:

Pierre Shales
Sediments eroded from surrounding terrain were carried by streams and rivers to be deposited on the floor of the seas that covered eastern Montana and the plains of North America for most of 500 million years. The final layer of sea sediments, called the Pierre Shale, was deposited 80 million years ago.

Fox Hills
68 million years ago, floods, wave action and wind redistributed the sands deposited along the Seaway's edge, laying down new patterns of the same sandy material. Later these sands become sandstones after they were subjected to the weight and pressures of additional layers deposited above.

Deposition
As stream currents slow, their loads of eroded material begin dropping out. The heaviest are the first to fall. Finer materials are carried farther as the stream slows in its approach to the delta where it joins the Seaway.

Climate
North America was closer to the equator 80 million years ago. The Seaway's breezes moderated the temperatures. Conditions were similar to the tropical seas of today.



Makoshika is the sum of its sediments. Sea-laid sediments underlie the park to a depth of 7,000 feet. An interactive Sediment Spinner allows visitors to stir up sediments, then watch them fall out by weight as the water turbulence subsides. Rock types show visitors the material from which the park is made.

Construction:
A 6'x4' horizontal wall panel made of laminate-covered particle board with heat-taped edges is attached to the wall with a gardner cleat. Titles, graphics and copy are silkscreened and photos are laminated to the panel under .125 inch clear plexiglass.

Photographs:
Mississippi delta area

Illustrations:
Graphic of Makoshika's sediments:
- Sea-Laid
  - Pierre Shale
  - Fox Hills
- Land-Laid
  - Hell Creek
  - Fort Union
- Air-borne
  - Loess

Fossil illustrations: ammonoids, dinosaur, humans and mammoth

Objects:
Sediment Spinner
Touchable siltstone, clays, limestone samples

Life Goes On

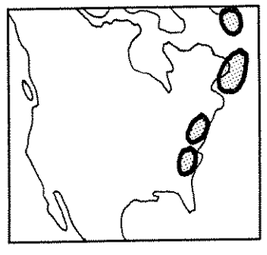
Copy:
Things Change
For 500 million years, the seas covering eastern Montana and much of North America rose and fell continually. The stress put on sea life as territories, temperatures and chemistries changed had dramatic impact on populations. Some vanished forever, their niches filled by others that could adapt.
Early Ordovician
480 million years ago
Middle Silurian
410 million years ago
Late Mississippian
330 million years ago

Maps of Transgression Peaks:

Early Ordovician
480 million years ago

Ordovician fossils
Trilobites- *Ogygiocaris, Ampyx, Bumastus, Onnia, Leptaena*
Brachiopods
Crinoids

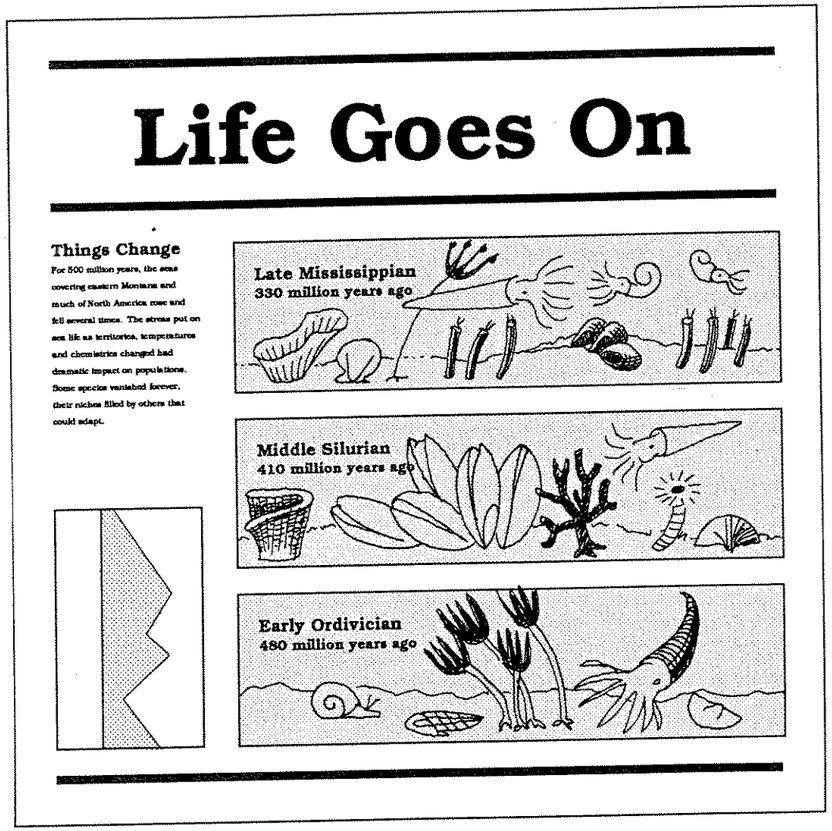
Middle Silurian
410 million years ago



Silurian fossils
Corals
Trilobites- *Dalamanites*
Brachiopods
Crinoids

Late Mississippian
330 million years ago

Mississippian fossils
Trilobites
Brachiopods
Crinoids



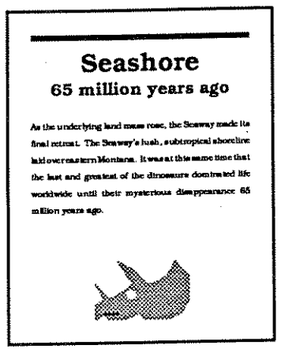
For 500 million years, the seas covering eastern Montana and much of North America rose and fell. An interactive panel allows visitors to view underwater scenes from three major transgressions and then compare them with their fossil remains located underneath the "flappers."

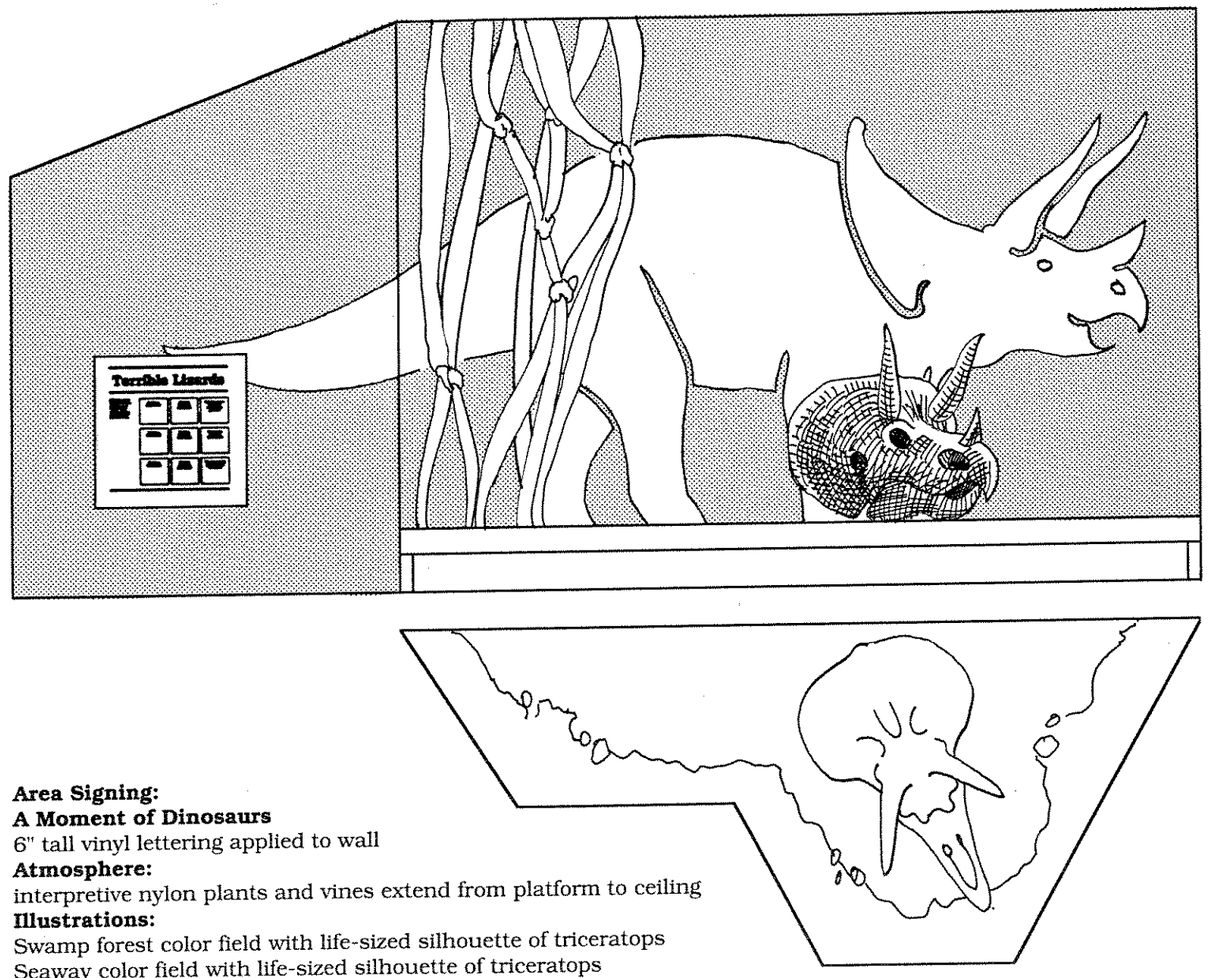
Construction:
A 4'x4' square wall panel made of laminate-covered particle board with heat-taped edges is attached to the wall with a gardner cleat. Titles, graphics and copy are silkscreened and photos are laminated to the panel under .125 inch clear plexiglass. Lights are built in and plug into electrical boxes located 6'-3" above the floor at a designated location.

Illustration:
Transgressions Chart
Ordovician, Silurian and Mississippian fossils

A Moment of Dinosaurs

Copy:
Seashore, 65 Million Years Ago
As the underlying land mass rose, the Seaway made its final retreat. The Seaway's lush, subtropical shoreline lay over eastern Montana. It was at this time that the last and greatest of the dinosaurs dominated life worldwide until their mysterious disappearance 65 million years ago.





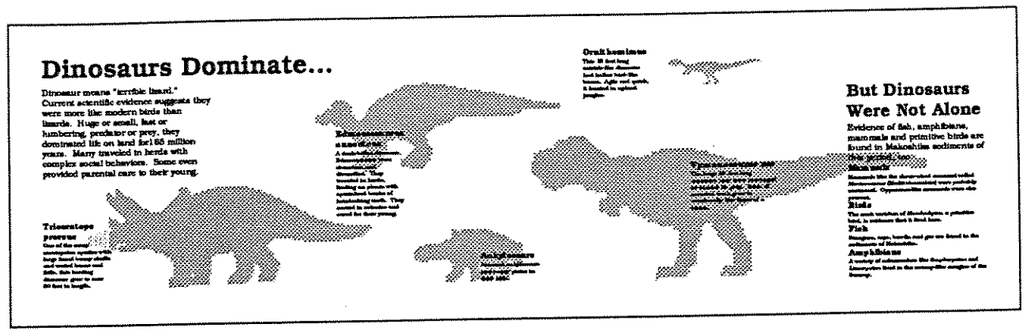
A triceratops silhouette on the wall and stage-set swamp plants and vines create the atmosphere of a subtropical delta swamp at the edge of a seaway 65 million years ago. A triceratops skull found in the park and prepared by the Museum of the Rockies rests on a platform. A pastel illustration by Doug Henderson provides a detailed view of an ancient world. A display panel describes the scene.

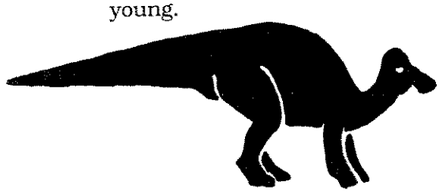
Area Signing:
A Moment of Dinosaurs
6" tall vinyl lettering applied to wall
Atmosphere:
interpretive nylon plants and vines extend from platform to ceiling
Illustrations:
Swamp forest color field with life-sized silhouette of triceratops
Seaway color field with life-sized silhouette of triceratops
Framed Doug Henderson pastel art measuring 2'-6"x3'-4" of a herd of triceratops of various ages and sexes amid lush plant growth circa 65 mya
Triceratops profile silhouette
Objects:
Prepared triceratops skull

Construction:
A platform riser provides support for a reader panel and protects fossils. The riser is 18" high and covered with rock to discourage visitors from stepping on to it. Electrical outlets and vents are hidden under the platform overhang
A 16" x 20" vertical wall panel made of laminate-covered masonite and backed with a spacer is attached to the wall with a gardner cleat. Titles, graphics and copy are silkscreened.

Dinosaurs Dominate

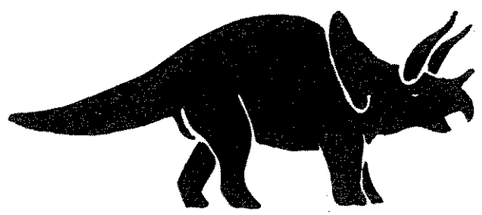
Copy:
Dinosaur Dominate...
Dinosaur means "terrible lizard." Current scientific evidence suggests they were more like modern birds than lizards. Huge or small, fast or lumbering, predator or prey, they dominated life on land for 165 million years. Many traveled in herds with complex social behaviors. Some even provided parental care to their young.





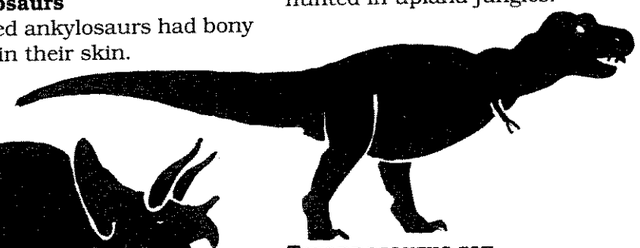
Edmontosaurus annectens
A species of duck-billed dinosaur, Edmontosaurs were abundant and diverse. They traveled in herds using specialized banks of interlocking teeth to feed on plants. They nested in colonies and cared for their young.

Ankylosaurs
Armored ankylosaurs had bony plates in their skin.



Triceratops prorsus
One of the many ceratopsian species with large bony skulls and varied horns and frills. This herding dinosaur grew to over 20 feet in length.

Ornithomimus
This 13 foot long ostrich-like dinosaur had hollow bird-like bones. Agile and quick, it hunted in upland jungles.



Tyrannosaurus rex
This huge 40 foot long carnivore may have scavenged or hunted its prey. Rows of serrated teeth grew in continually like those of a shark.

But Dinos Were Not Alone
Evidence of fish, amphibians, mammals and primitive birds are found in Makoshika's sediments of this period, too.

Mammals
Mammals like the shrew-sized *Meniscoessus* (Multituberculata) were probably nocturnal. Opposum-like mammals were also present.

Birds
The neck vertebrae of *Monchodytes*, a primitive bird, is evidence that it lived in Makoshika.

Fish
Sturgeon, rays, bowfin and gar are found in the sediments of Makoshika.

Amphibians
A variety of salamanders like *Scapherpeton* and *Lisserpeton* lived in the swamp-like margins of the Seaway.

A panel with fossils and graphics explores "terrible lizards." Current scientific evidence suggests they were more like modern birds than lizards. Huge or small, fast or lumbering, predator or prey, they dominated life on land for 165 million years. Many traveled in herds with complex social behaviors. Some even provided extended parental care to their young. Other animals are also found in the same sediments.

Construction:
A 16"x5' inclined reader panel made of laminate-covered particle board attaches to the platform with metal supports. Titles, graphics and copy are silkscreened. Objects are attached and protected by a plexiglass box covering the entire panel and secured with security screws.

Illustrations:
Meniscoessus (Multituberculata)
Pediomys hatcheri (Marsupialia)
Didelphodon vorax (Marsupialia)
Monchodytes (Gaviiformes)
Sturgeon and Gar
Scapherpeton or Lisserpeton

Objects:
Edmontosaur tooth, jaw, limb bone, toe bone, or vertebra
Ankylosaur tooth or club cast
Triceratops tooth and jaw and touchable skin cast
Ornithomimus toe bone
Tyrannosaurus rex touchable bronze tooth

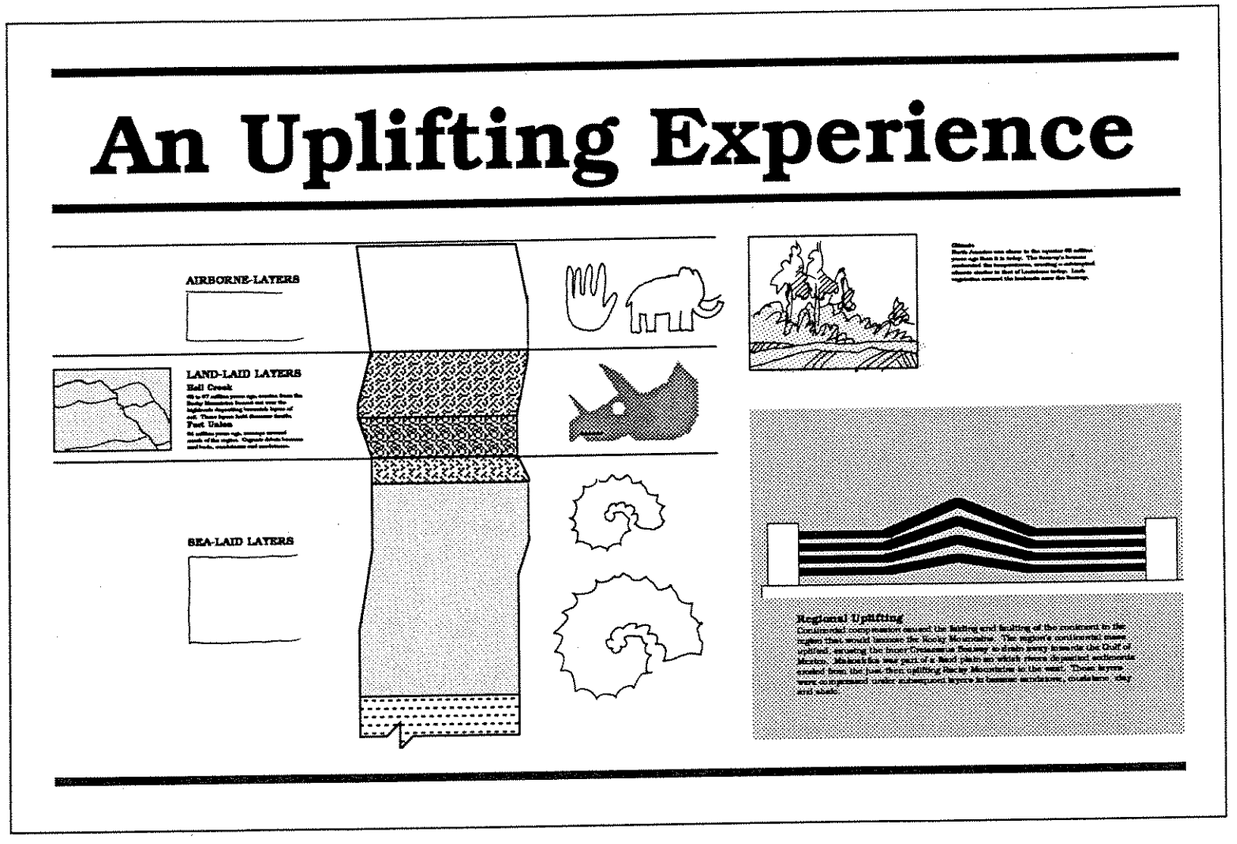
An Uplifting Experience

Regional Uplifting
Continental compression caused folding and faulting in the region that would become the Rocky Mountains. The region's continental mass uplifted, causing the Inner Cretaceous Seaway to drain away toward the Gulf of Mexico. Makoshika was part of a floodplain on which rivers deposited sediments eroded from the just-then uplifting Rocky Mountains to the west. These layers were compressed under subsequent layers to become sandstone, mudstone, clay and shale.

Hell Creek
67 to 65 million years ago, erosion from the Rocky Mountains fanned out over the highlands, depositing new brownish layers of sediments. These layers hold dinosaur fossils.

Fort Union
64 million years ago, swamps covered much of the region. Organic debris became coal beds along with sandstones and mudstones.

Climate
North America was closer to the equator 65 million years ago than it is today. The Seaway's breezes moderated the temperatures, creating a subtropical climate similar to that of Louisiana today. Lush vegetation covered the lowlands near the Seaway.



4,800 feet of sediments were deposited over the Makoshika region during the Age of the Reptiles. Most of these sediments were sea-laid, but as the Seaway retreated, land-laid deposition made its contribution, too. An interactive "Compression Uplifter" allows visitors to see what happens to sediments when compression occurs. Rock types show visitors the material of which the park is made.

Construction:
A 6'x4' horizontal wall panel made of laminate-covered particle board with heat-taped edges is attached to the wall with a gardner cleat. Titles, graphics and copy are silkscreened and photos are laminated to the panel under .125 inch clear plexiglass.
Photographs:
Louisiana swamp
Illustrations:
Graphic of Makoshika's sediments:
- Pierre Shale
- Fox Hills
- Hell Creek
- Fort Union
- Loess

Objects:
Interactive Compressional Carpet Layers Uplifter
Touchable sandstones and mudstone samples

Extinction: Do or Die

The "Real Reason Dinosaurs Died Out" wasn't smoking, but rather because they failed to adapt to changing conditions. A panel presents the debate over whether they vanished gradually or rapidly in a cataclysmic event. Research at Makoshika is providing dinosaur extinction evidence.

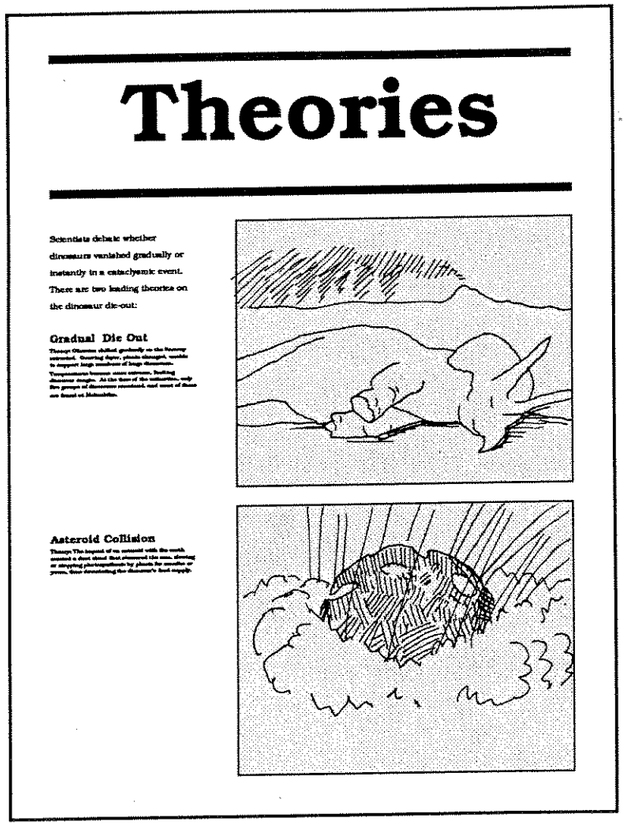
Copy:
Extinctions
Mass extinctions have occurred frequently in the geological record. In fact, the boundaries of geological eras are defined by major extinctions of many species. One animal's disaster is another animal's opportunity. Dinosaurs failed to adapt to changing conditions. With dinosaurs gone, mammals diversified, filling the niches vacated by dinosaurs.

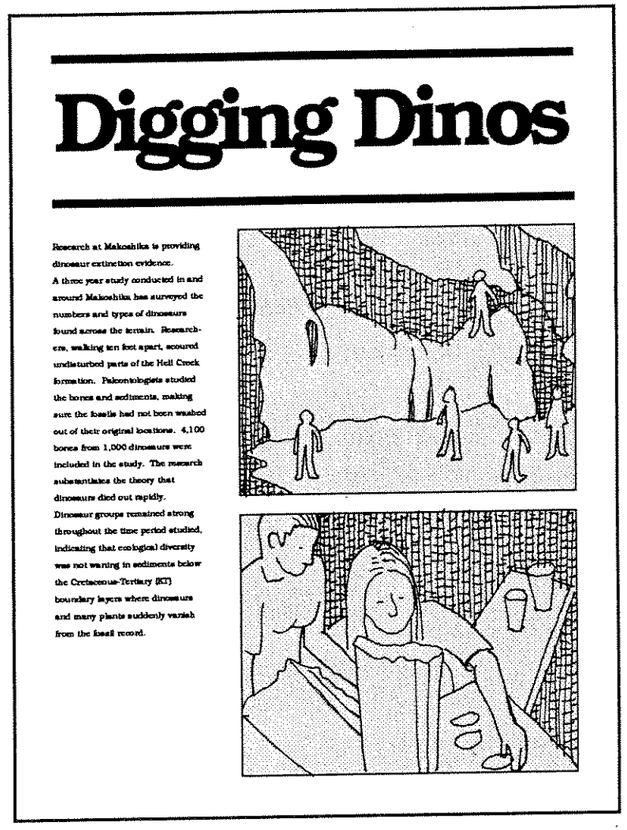
Theories & Evidence:
Scientists debate whether dinosaurs vanished gradually or rapidly in a cataclysmic event. There are two leading theories on the dinosaur die out:

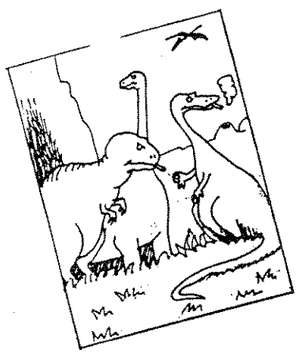
Gradual Die Out
Theory: Climates shifted gradually as the Seaway retreated. As it grew drier, plants changed, unable to support large numbers of huge dinosaurs. Temperatures became more extreme, limiting dinosaur ranges. At the time of the extinction, only five groups of dinosaurs remained, and most of which are found at Makoshika.

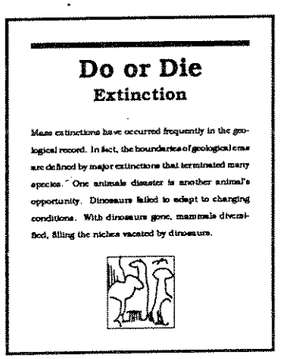
Asteroid Collision Theory
Theory: The impact of an asteroid with the earth created a dust cloud that obscured the sun, slowing or stopping photosynthesis by plants for months or years, thus devastating the dinosaurs' food supply.

Vanishing Act Theory
Research at Makoshika is providing dinosaur extinction evidence.
A three year study conducted in and around Makoshika has surveyed the numbers and types of dinosaurs found across the terrain. Researchers, walking ten feet apart, scoured undisturbed parts of the Hell Creek formation. Paleontologists studied the bones and sediments, making sure the fossils had not been washed out of their original locations. 4,100 bones from 1,000 dinosaurs were included in the study. The research substantiates the theory that dinosaurs died out rapidly. Dinosaur groups remained strong throughout the time period studied, indicating that ecological diversity was not waning in sediments below the Cretaceous-Tertiary (KT) boundary layers where dinosaurs and many plants suddenly vanished from the fossil record.









Construction:
A 16" x 20" vertical wall panel made of laminate-covered masonite and backed with a spacer is attached to the wall with a gardner cleat. Titles, graphics and copy are silkscreened.
Two 3'x4' vertical wall panels made of laminate-covered particle board with heat-taped edges is attached to the wall with a gardner cleat. Titles, graphics and copy are silkscreened and photos are laminated to the panel under .125 inch clear plexiglass.
Photographs:
#91 or 92 Survey slide-8 people spaced in middle distance
#55 Mapping fossils
Illustrations:
Gary Larson Cartoon
Major Extinctions through Earth history
Asteroid Art
Dead Dinosaur Art

Terrible Lizards

Copy:
A Big Success!
For 165 million years, dinosaurs dominated life on earth. But they existed at Makoshika for only 2.2 million years. Test your knowledge of these Montanans of the past.

Is this a Dinosaur?
No! Giant flying reptiles like *Quetzelcoatlus* were common in the world of the dinosaurs, but dinosaurs, by definition, could not fly.

Is this a Dinosaur?
No! Giant swimming reptiles like Mosasaur lived in water, but dinosaurs were terrestrial and lived only on land.

Is this a Dinosaur?
Yes! *Ornithomimus*, like all dinosaurs, is a land animal, neither living in water nor able to fly.

Did this Dinosaur live here?
No! *Stegasaurus* lived before the seaway that covered Makoshika retreated.

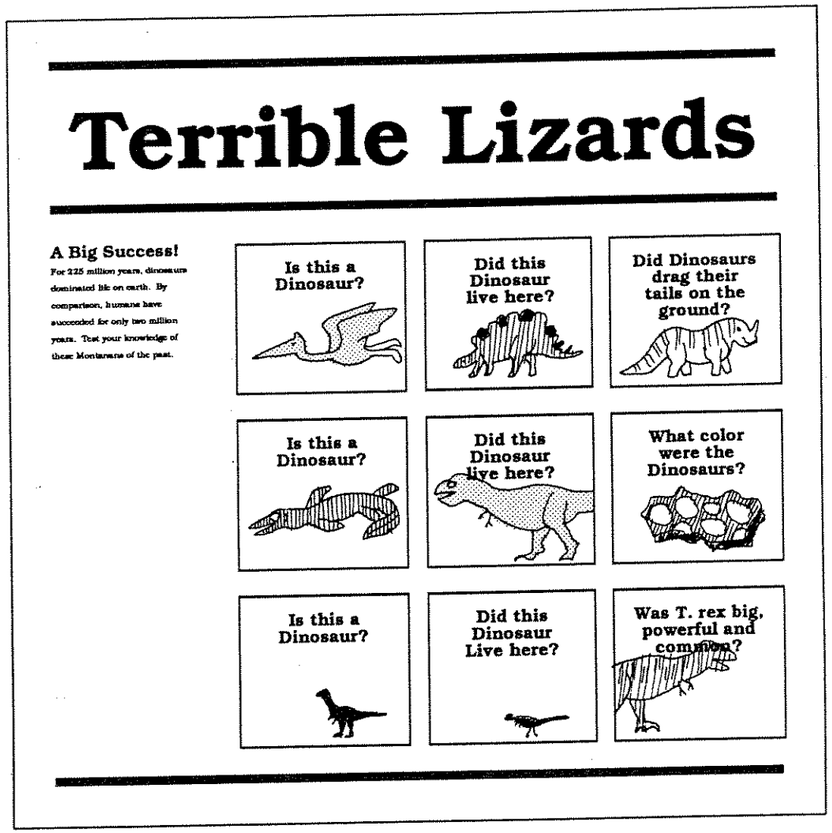
Did this Dinosaur live here?
Yes! *Tyrannosaurus rex*, one of the very last dinosaurs to walk the earth, lived at the edge of a sea in this area 65 million years ago.

Did this Dinosaur live here?
We don't know! The layers in which early dinosaurs like Coelophysis would be buried have eroded or were never deposited.

Did Dinosaurs drag their tails on the ground?
No! Dinosaurs that walked on two legs had stiff tails with bony tendons that counterbalanced the body's weight.

What color were the dinosaurs?
No one knows! Skin and flesh usually decay before burial and fossilization. Minerals replace tissue in the few skin fossils that exist, leaving no color clues.

Was *T rex* big, powerful and common?
Yes and No! *T rex* was big (40 feet long) and powerful (able to lift 426 pounds with a single arm)! But *T rex* was uncommon. Only eight articulated skeletons have been found.

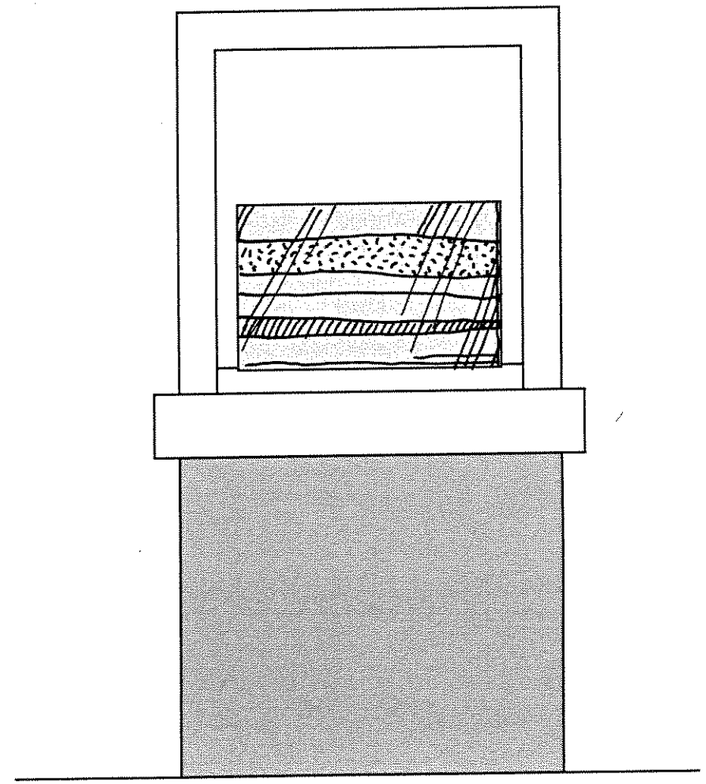


For 165 million years, dinosaurs dominated life on earth. They existed at Makoshika for only 2.2 million years. Visitors test their knowledge of dinosaurs by answering the questions on the panel. Answers are underneath the "flappers."

Construction:
A 4'x4' square wall panel made of laminate-covered particle board with heat-taped edges is attached to the wall with a gardner cleat. Titles, graphics and copy are silkscreened and photos are laminated to the panel under .125 inch clear plexiglass. Lights are built in and plug into electrical boxes located 6'-3" above the floor.

Illustrations:
Map of region circa 80 mya
Map of region circa 65 mya
Map of region circa x mya
Quetzelcoatlus
Mosasaur
Ornithomimus
Stegasaurus
Tyrannosaurus rex
Coelophysis
Waterhouse Hawkins illustration of Iguanadon
Colorful Hadrosaur
Tendons and tail vertebrae illustration
Skin fossils art
T rex excavation map
Sediment column showing missing sediments

The KT Boundary



Dinosaur fossils disappear at the boundary between the end of the Age of Dinosaurs ("K" is the abbreviation for Cretaceous) and the beginning of the Age of Mammals ("T" is the abbreviation for Tertiary). This layer of clay, with strong traces of the element iridium, appears worldwide in sediments 65 million years old. An exhibit case displays KT Boundary sediments.

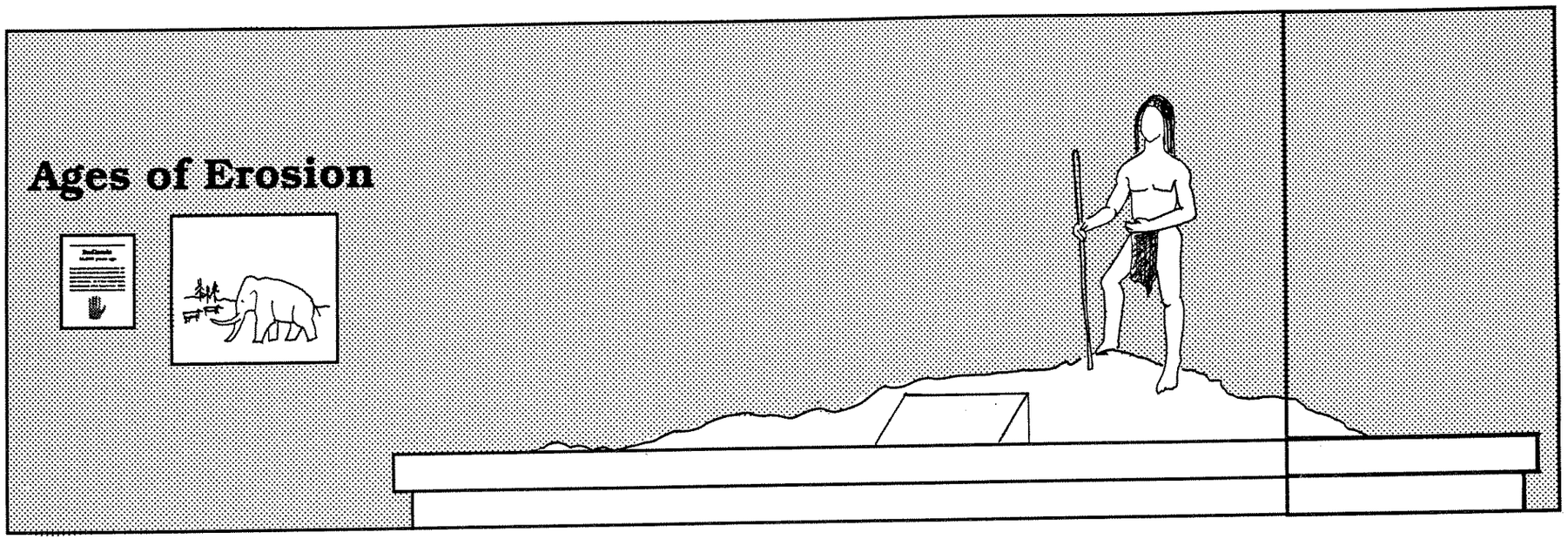
Copy:
KT Boundary
A layer of clay with strong traces of the element iridium is found worldwide in sediments 65 million years old. It is in these same layers that fossil evidence of dinosaurs disappears. Dinosaurs were among the species of plants and animals that disappeared at the shift from the K:Cretaceous Period (the last part of the Mesozoic Era's Age of Dinosaurs) to the T:Tertiary Period (the first part of the Cenozoic's Age of Mammals) sediments.

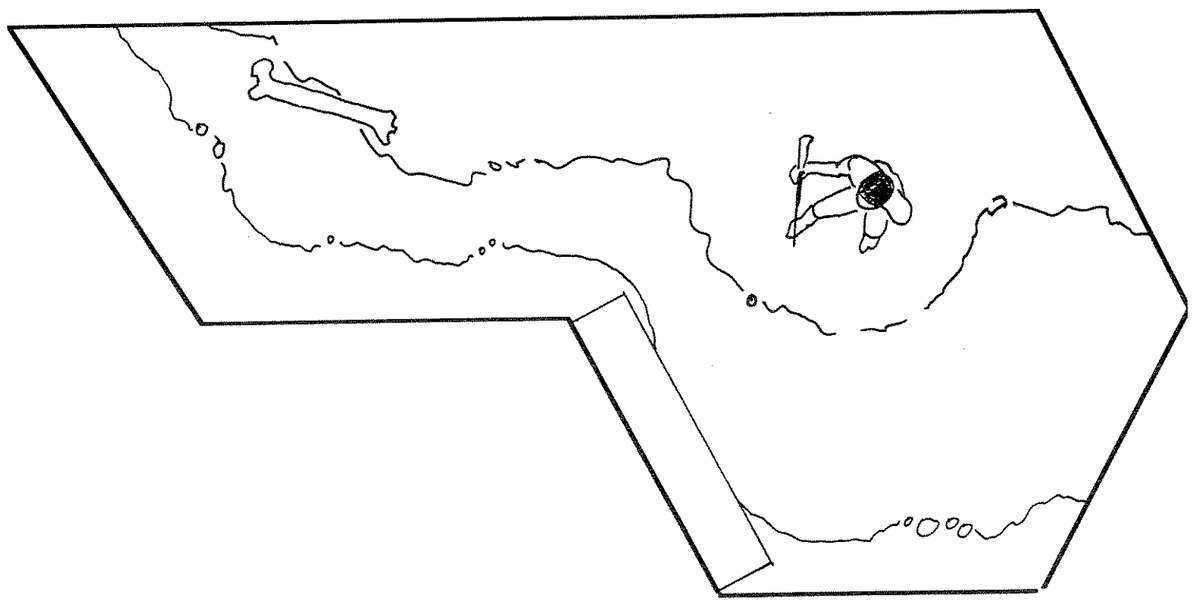
Construction:
A 2'-6" square x 5' high display case made of laminate-covered particle board with toe kick and wood frame on a plexiglass top secured with security screws. A 2'-0" wide interior panel has silkscreened titles, graphics and copy.

Photographs:
KT Boundary Landscape

Illustrations:
Objects:
Chunk of KT Boundary sediments bound with butvar

Ages of Erosion: Badlands 11,000 years ago





Copy:
Badlands, 11,000 Years Ago
Ice Age glaciers ground bedrock into fine dust. Airborne, this dust capped the sea and landlaid sediments of the Makoshika area, compacting into rich soil layers called loess. All of these sediment layers, totaling thousands of feet, began to erode. Buried layers of sandstone and shale were revealed.

A platform supports an outcrop of rock that allows an early hunter-gatherer to look out over the landscape in search of big game. Bison bones, tools and flakes lie in the foreground at his feet. A pastel illustration by Doug Henderson provides a detailed view of the scene 11,000 years ago. A panel provides a description of the scene.

Area Signing: Ages of Erosion
6" tall vinyl lettering applied to wall
Illustrations:
A color field suggests the perameters of the environment
Framed Doug Henderson pastel art measuring 2'-6"x3'-4" of Mammoth and Giant Bison grazing on open areas (loess) with Badland outcrops circa 11,000 years ago
Bison skull
Objects:
Native American male mannequin with straight, black hair
Tanned buffalo hide loin cloth, footwear
Atlatl, spear thrower, 2 darts
Bison bones
Flake of porcelanite
(Dale Herbort in York, MT for replicates)
Construction:
A platform riser provides support for a reader panel and protects the mannequin and artifacts. The riser is 18" high and covered with rock to discourage visitors from stepping on to it. Electrical outlets and vents are hidden under the platform overhang.
A 16" x 20" vertical wall panel made of laminate-covered masonite and backed with a spacer is attached to the wall with a gardner cleat. Titles, graphics and copy are silkscreened.

Heavy Traffic on Icy Interstate

Humans made their way to North America over a land bridge from Asia during the Ice Ages. A panel explores the fact that other species, such as the horse, used this same route, but traveled in the opposite direction.

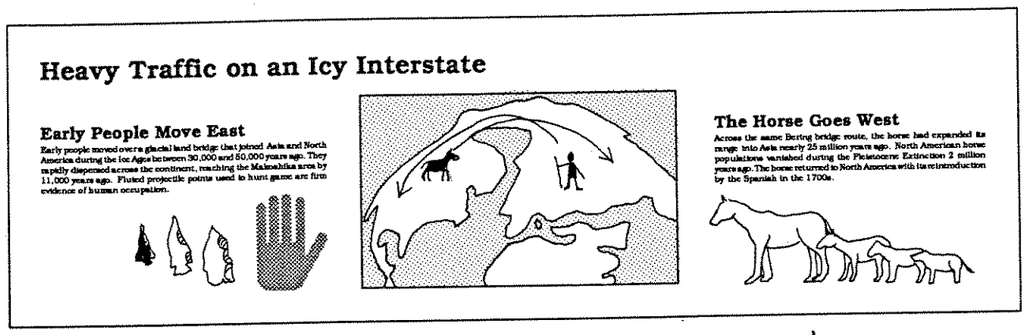
Copy:

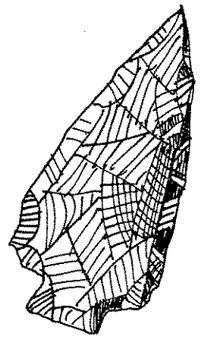
Humans Move East

Early people moved over a glacial land bridge that joined Asia and North America more than 12,000 years ago when sea levels fell. They rapidly dispersed across the continent, reaching the Makoshika area by 11,000 years ago. Fluted projectile points used to hunt game are firm evidence of human occupation that has continued through historic tribes.

The Horse Goes West

Across the same Bering land bridge route, the horse expanded its range into Asia nearly 25,000 years ago during an earlier Ice Age. North American horse populations vanished during the Pleistocene Extinction 10,000 years ago. The horse returned to North America with its reintroduction by the Spanish to Mexico in the 1500s.





Construction:
A 16"x5' inclined reader panel made of laminate-covered particle board attaches to the platform with metal supports. Titles, graphics and copy are silkscreened. Objects are attached and protected by a plexiglass box covering the entire panel and secured with security screws.

Photographs:
m

Illustrations:
Diagram of Bering Strait Routes
Series of Early Horse illustrations
Hand Graphic for man

Objects:
Projectile Point Replicas

Canada's Loess is Our Gain

Copy:

Loess

Beginning more than 25,000 years ago, the most recent of the Ice Ages advanced out of Canada into the northern parts of Montana. Climatic warming melted the ice, forming extensive glacial lakes. When these lakes evaporated, tons of fine dust were carried by wind into the upper atmosphere. These fine particles later settled out in thick, widespread layers that developed into rich soils over the High Plains. Capping the sediment layers in Makoshika, the loess layers are now nearly eroded away by the relentless forces of water and gravity.

Erosion

What goes up must come down. Volcanism, mountain building and sedimentary deposition are all means of raising rock. No sooner does it rise than erosion begins to reduce it through the relentless forces of water and gravity.

Slumping

Pierre Shale sediments lack cohesion and absorb water. Becoming heavy, they shear off under their own weight and collapse.

Swallow holes

The action of water seeping below the surface cuts "pipes" through soft sediment layers. Overlying sediments collapse and, as these holes grow larger, they occasionally reach the surface.

Landslides

Whole blocks of earth may slide almost intact to a lower position.

Mudflow

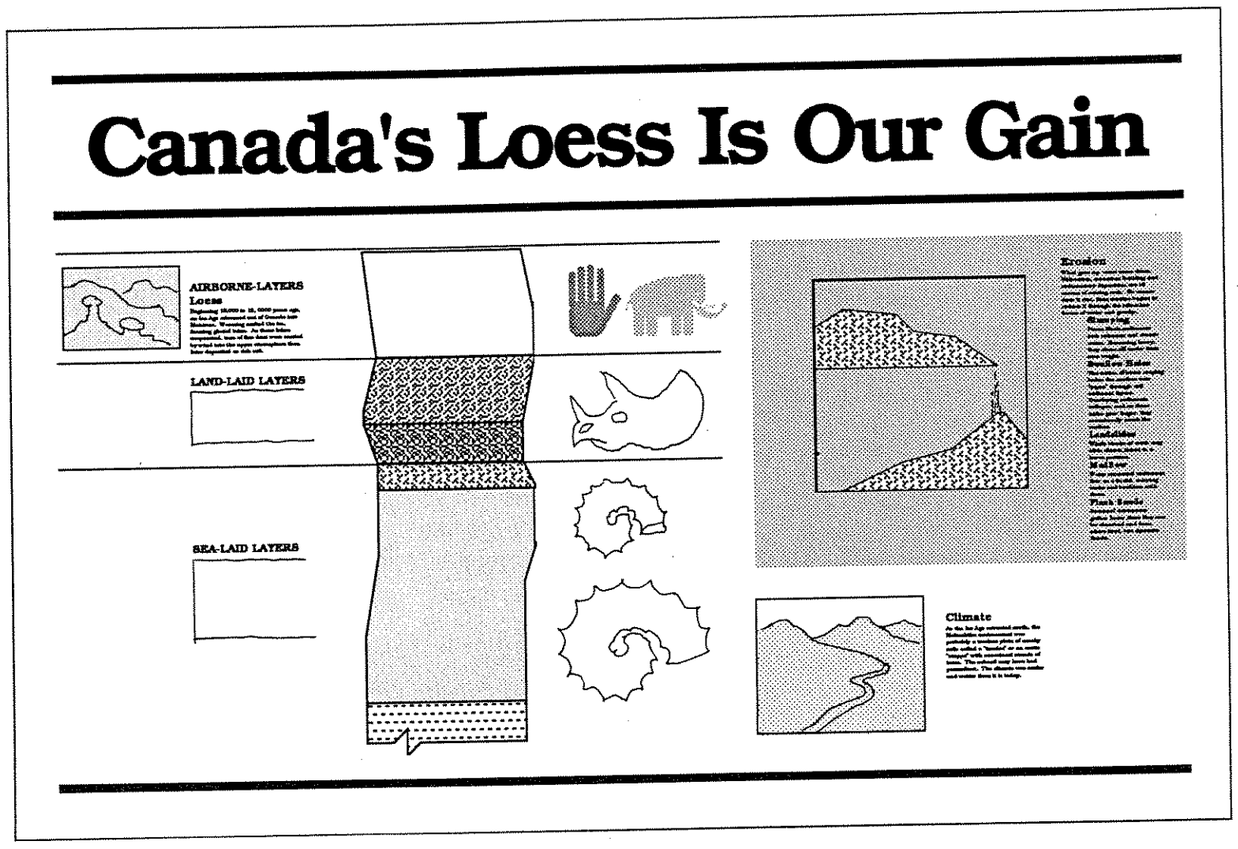
Water-saturated sediments flow as a liquid, carrying rocks and boulders with them.

Flash floods

Seasonal downpours generate water faster than it can be absorbed, forming short-lived but dynamic floods.

Climate

As the glacial ice retreated north, the Makoshika environment was probably a treeless plain of mucky soils called "tundra," or arctic "steppe" with occasional stands of trees. The subsoil may have contained permafrost. The climate was cooler and wetter than it is today.



Loess is wind-blown silt generated as glacial ice scours bedrock. Capping the sediment layers in Makoshika, the Loess layers are now nearly eroded away by the relentless forces of water and gravity. Visitors activate a "Soil Eroder" and watch sediments wash downstream.

Construction:

A 6'x4' horizontal wall panel made of laminate-covered particle board with heat-taped edges is attached to the wall with a gardner cleat. Titles, graphics and copy are silkscreened and photos are laminated to the panel under .125 inch clear plexiglass.

Photographs:

Makoshika Badlands
Slumping
Swallow Holes
Landslides
Flashfloods
Loess
Steppe

Illustrations:

Graphic of Makoshika's sediments:
- Pierre Shale
- Fox Hills
- Hell Creek
- Fort Union

Objects:

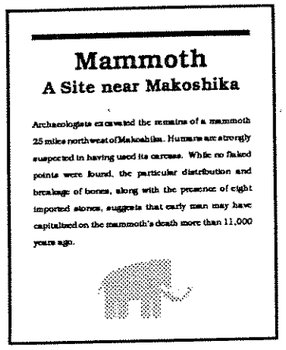
Boxed Loess sample
Soil Eroder- a Montana-Made coffee table sculpture

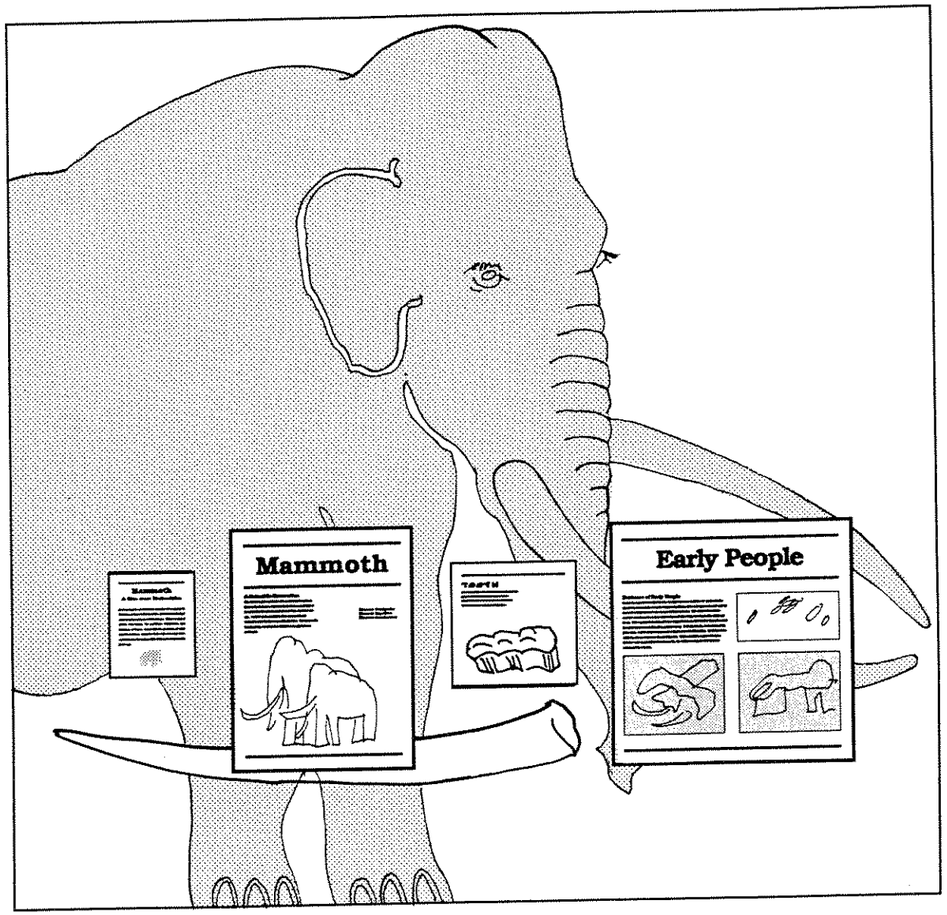
Mammoth: Scavenging near Makoshika

Copy
Mammoth
A site near Makoshika
Archaeologists excavated the remains of a mammoth 25 miles northwest of Makoshika. Humans are strongly suspected of having used the carcass. While no flaked points or other artifacts were found, the particular distribution and breakage of bones, along with the presence of eight imported stones, suggests that early hunters may have capitalized on the mammoth's death more than 11,000 years ago.

Mammoth tooth
Study of the molars determined that the Mammoth was *Mammuthus imperator*, the earliest and largest of the New World mammoths. The size of the teeth and the amount of wear, compared with living elephants, indicated that the animal was about 45 years old at the time of its death.

Tusks
The 8 3/4 foot long tusks, along with the molars, indicate that the mammoth was a mature bull. The tusk ivory is chalky because weathering has leached away much of the tusk's calcium content. By measuring the skeletal parts, scientists calculated that the mammoth stood 14 feet high.

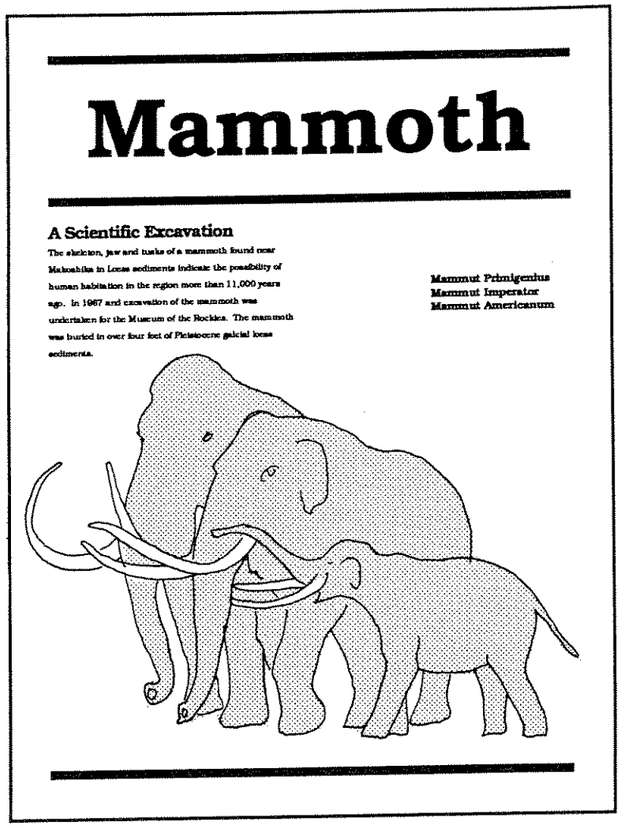


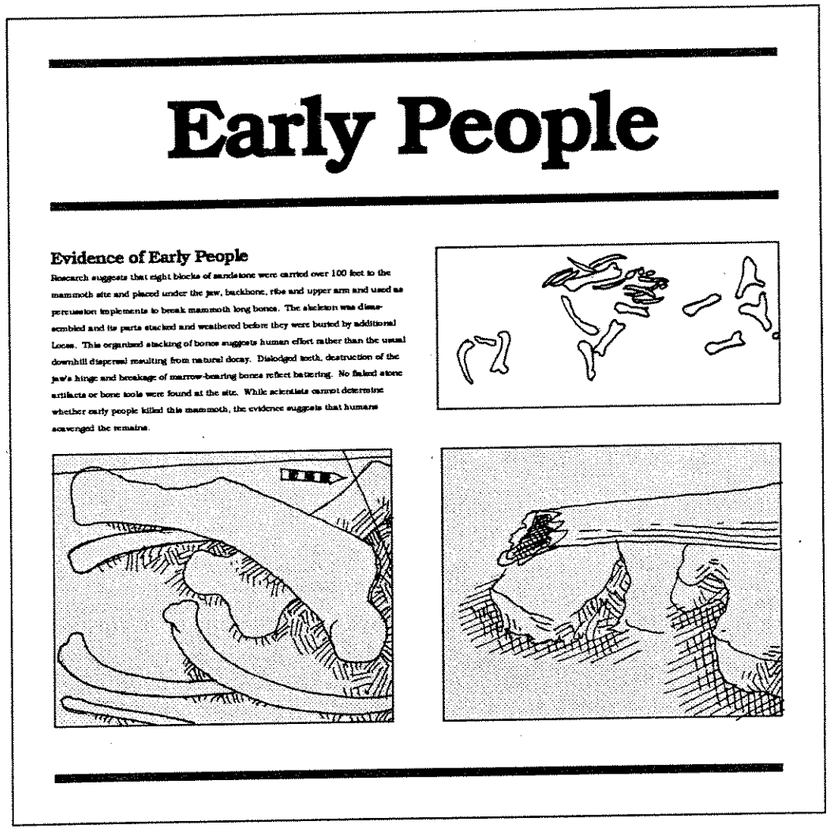


Research at and near Makoshika is providing evidence of early humans in Montana. A mammoth tooth, wall graphics and excavation documents present possible evidence for humans being in the region more than 11,000 years ago.

Construction:
A 16" x 20" vertical wall panel made of laminate-covered masonite and backed with a spacer is attached to the wall with a gardner cleat. Titles, graphics and copy are silkscreened.
A 2'x2' square wall panel made of laminate-covered masonite and backed with a spacer is attached to the wall with a gardner cleat. Titles, graphics and copy are silkscreened. A mammoth molar is attached and the entire panel is covered by a plexiglass box secured with security screws.
Photographs:
Life-sized Mammoth tusk photo
Illustrations:
4.3 meter high imperial mammoth bull wall silhouette
Mammoth silhouette for panel
Objects:
Mammoth molar

Mammoth: Scavenging Near Makoshika





Copy:

A Scientific Excavation

The skeleton of a mammoth found near Makoshika in loess sediments indicate possible human habitation in the region more than 11,000 years ago. In 1967, an excavation of the mammoth was undertaken for the Museum of the Rockies. The mammoth was buried 4 1/4 feet deep in Pleistocene glacial loess sediments.

Evidence of Early Hunter/Gatherers

Research suggests that eight blocks of sandstone were carried over 100 feet to the mammoth site and placed under the jaw, backbone, ribs and upper leg and probably used as percussion implements to break mammoth long bones. The skeleton was disassembled and its parts stacked and weathered before they were buried by additional loess. This organized stacking of bones suggests human effort rather than the usual downhill dispersal resulting from natural decay. Dislodged teeth, destruction of the jaw's hinge and breakage of marrow-bearing bones reflect battering. No flaked stone artifacts or bone tools were found at the site. While scientists cannot determine whether early people killed this mammoth, the evidence suggests that humans scavenged the remains.

Construction:

One 3'x4' vertical wall panel and one 4'x4' square panel are made of laminate-covered particle board with heat-taped edges is attached to the wall with a gardner cleat. Titles, graphics and copy are silkscreened and photos are laminated to the panel under .125 inch clear plexiglass.

Illustrations:

Illustrations and identification of various Mastodon and Mammoth species of North America

Excavation Diagram

Objects:

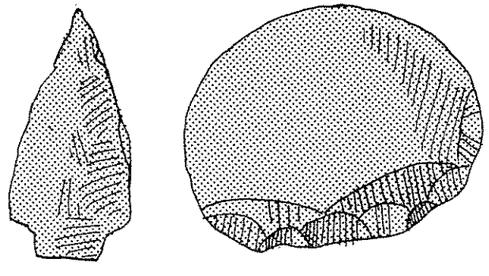
Re-created Fort Union sandstone block (all 8 weighed 4.5 kg)

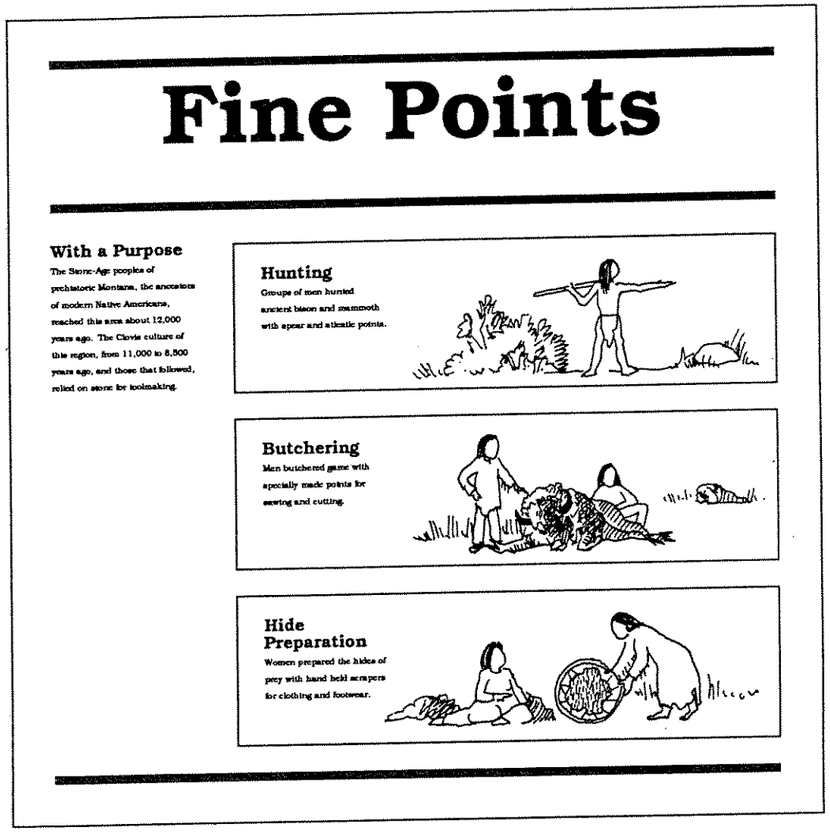
Fine Points

Flaked projectile points found throughout the Makoshika region are evidence of the presence of early people. Visitors discover which kinds of tools were used by which family members for differing tasks. Beneath the "flapper" illustrations are examples of recreated points.

Copy:
With a Purpose
The Stone Age peoples of prehistoric Montana, the early ancestors of modern Native Americans, reached this area about 12,000 years ago. The Clovis culture that populated the region from 11,500 to 11,000 years ago, as well as those that followed, relied heavily on stone for tool-making.

Hunting- Groups of men hunted ancient mammoth and bison with spear throwers and dart.
Butchering- Men and women butchered game with specially made knives for cutting and severing ligaments and tissue.
Hide Preparation- Women prepared the hides of prey, using hand-held scrapers, to make clothing and footwear.





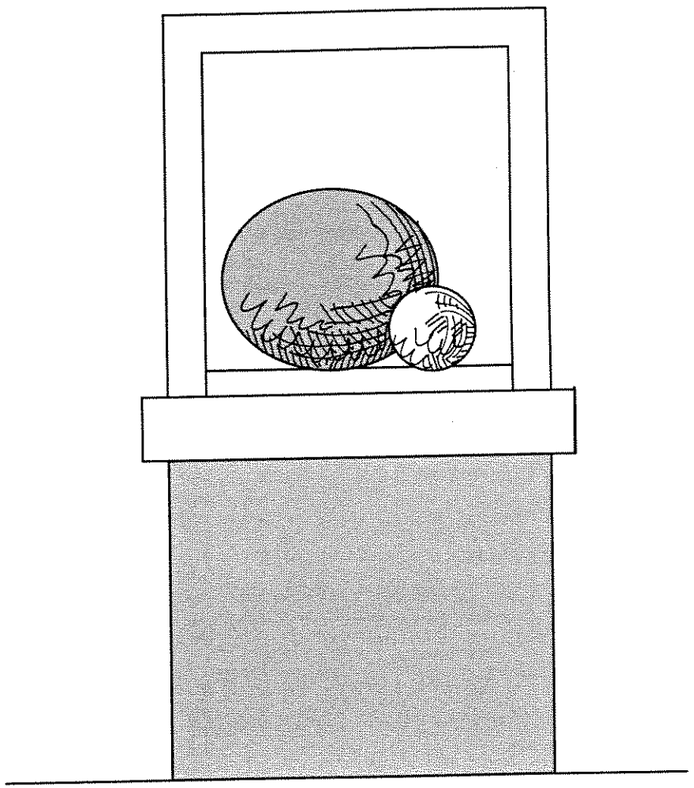
Construction:
A 4'x4' square wall panel made of laminate-covered particle board with heat-taped edges is attached to the wall with a gardner cleat. Titles, graphics and copy are silkscreened and photos are laminated to the panel under .125 inch clear plexiglass. Lights are built in and plug into electrical boxes located 6'-3" above the floor.

Illustrations:
Men hunting
Men and women butchering
Women preparing skins

Objects:
Clovis points for hunting, knives for butchering and scrapers for hide preparation

Between a Rock and a Hard Spot

Copy: Between a Rock and a Hard Spot
Pedestals, knobs, goblins and potatoes all describe the concretions found within Makoshika Park. These globular rocks are hard spots found in softer surrounding matrix like siltstone. Concretions occasionally form around plant or animal remains that serve as a nucleus. The materials leaching out of the remains during the process of fossilization permeate the surrounding matrix and contribute to the hardness of the concretion. Other concretions form as irregular mineral composition or textural shapes in layers of sediment.



Found throughout the Park, concretions are known by a variety of names: pedestals, knobs, goblins and potatoes. An exhibit case displays examples of these hard spots in the sediments.

Construction:
A 2'-6" square x 5' high display case made of laminate-covered particle board with toe kick and wood frame on a plexiglass top secured with security screws. A 2'-0" wide interior panel has silkscreened titles, graphics and copy.
Photographs:
Concretions in situ
Illustrations:
Diagram of concretion formation
Objects:
Concretions
Halved concretion with fossil nucleus

Look Again...It's Not Barren

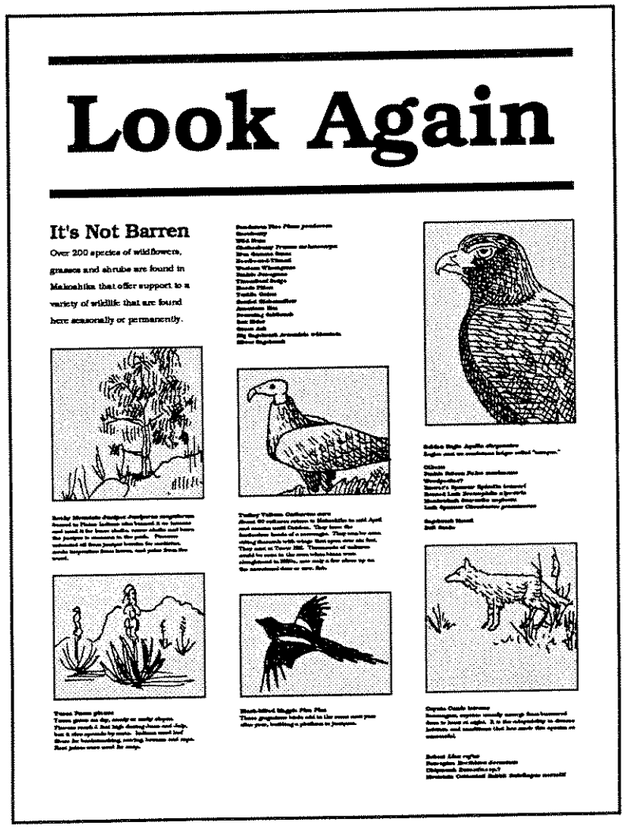
Copy:
It Isn't Barren
Over 200 species of wildflowers, grasses and shrubs are found in Makoshika, offering support to a variety of wildlife found here seasonally or year round.

Plants:
Rocky Mountain Juniper
Sacred to Plains Indians who burned it as incense and used it for lance shafts, arrow shafts and bows, the juniper is common in the park. Pioneers extracted oil from juniper berries for medicine, made turpentine from leaves, and poles from the wood.
Yucca
Yucca grows on dry sandy or rocky slopes. Flowers reach four feet during June and July, but it also spreads by roots. Indians used leaf fibers for basketmaking, sewing, brooms and rope. Root juices were used for soap.
Others:
Ponderosa Pine
Snowberry
Wild Plum
Chokecherry
Blue Gamma Grass
Needle-and-Thread
Western Wheatgrass
Prairie Junegrass
Threadleaf Sedge
Hoods' Phlox
Textile Onion
Scarlet Globemallow
American Elm
Fourwing Saltbrush
Box Elder
Green Ash
Big Sagebrush
Silver Sagebrush

Birds:
Turkey Vulture
About 60 vultures return to Makoshika in mid-April and remain until October. They have the featherless heads of a scavenger. They can be seen riding thermals with wings that span over six feet. They nest at Tower Hill. Thousands of vultures could be seen in the area when bison were slaughtered here in the 1880s, but now only a few clean up the occasional deer, cow or fish.
Black-billed Magpie
These gregarious birds add to the same nest year after year, building platforms in junipers.
Golden Eagle
Eagles nest on sandstone ledges called "scrapes."
Others:
Prairie Falcon
Woodpecker
Brewer's Sparrow
Horned Lark
Meadowlark
Lark Sparrow

Reptiles:
Sagebrush lizard
Bull Snake

Mammals:
Coyote
Scavengers, coyotes usually emerge from burrowed dens to hunt at night. Its adaptability to diverse habitats and conditions has made this species so successful.
Bobcat
Porcupine
Chipmunk
Mountain Cottontail Rabbit
White-tailed Deer
Mule Deer
Pronghorn



Photos, art and copy document the diversity of life that lives today in what many visitors perceive as a barren, empty place.

Construction:
A 3'x4' vertical wall panel made of laminate-covered particle board with heat-taped edges is attached to the wall with a gardner cleat. Titles, graphics and copy are silkscreened and photos are laminated to the panel under .125 inch clear plexiglass.

Photographs:
Rocky Mountain Juniper
Yucca
Bull Snake
Coyote
Golden Eagle
Turkey Vulture
Black-billed Magpie

There's Lots to Do

A panel introduces the visitor to the policies, opportunities and activities offered by the park.

Copy:
There's Lots to Do
Camping
Camp sites are available one mile inside the park.
Picnicking
Picnic tables are located at several points.
Hiking & Interpretive Trails
Take adequate water. Watch out for rattlesnakes, ticks and flash floods. Trails are steep and slippery when wet. Let someone know your hiking plans.

Kinney Coulee Trail descends 300 feet to the bottom of the badlands.

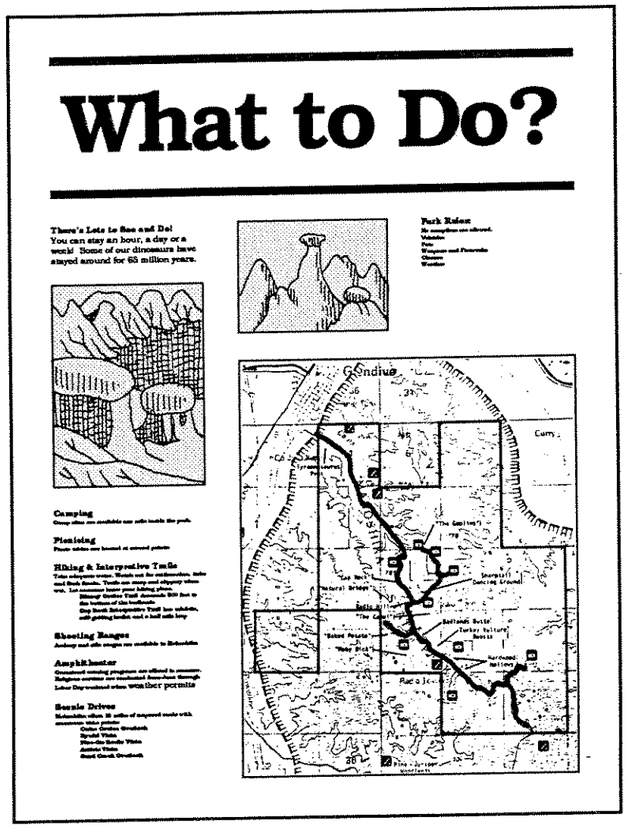
Cap Rock Interpretive Trail has exhibits, a self-guiding leaflet and a half mile loop.

Scenic Drives & Photo Opportunities
Makoshika offers 12 miles of unpaved roads with numerous vista points:

Cains Coulee Overlook
Eyeful Vista
Pine-On-Rocks Vista
Artists Vista
Sand Creek Overlook

Shooting Ranges
Archery and rifle ranges are available in Makoshika.
Amphitheater
Occasional evening programs are offered in summer. Religious services are conducted from June through Labor Day weekend when weather permits.

Park Rules:
No campfires are allowed.
Vehicles
Pets
Weapons and Fireworks
Closure
Weather



Construction:
A 3'x4' vertical wall panel made of laminate-covered particle board with heat-taped edges is attached to the wall with a gardner cleat. Titles, graphics and copy are silkscreened and photos are laminated to the panel under .125 inch clear plexiglass.

Photographs:
Aerial Photo of the Park
Cains Coulee Overlook
Eyeful Vista
Pine-On-Rocks Vista
Artists Vista
Sand Creek Overlook

Illustrations:
Silkscreened Features, Roads & Trails overlays aerial photo

Design Vocabulary

Art
Exhibit Panel Art: individually screened artwork on panels is generally of one color, though several colors may be used on a panel. Other artwork is to be line art, screened over a flat color block.

Color Themes for Wall Surfaces
Standard latex acrylic interior house paint with matte texture should be used. Sherwin Williams colors are specified:

Walls	
Introduction & Theater	as is
Seas of Time Platform Walls	SW1750
A Moment of Dinos Platform	SW1447
Ages of Erosion Walls	SW1349
Murals	
Mosasaur	SW1022
Triceratops	SW1435
Mammoth	SW1349

Color Themes for Graphic Panels
Flat enamel silkscreen ink should be custom mixed to match the Pantone Matching System as specified:

Sediments		
Air-borne	yellow	461
Land-laid	lime	580
Sea-laid	blue-green	556
Fossils	grays, brown	400 415 450
Seas	light blue	304
Land	tan	465
Mosasaur	gray	400
Triceratops	green	580
Hand	orange	145
Horses	tan	465
People	tans, black	463 465
Accents	purple	267
Copy	black	

Color Themes for Laminates
Laminates in the following colors is specified in the following matte colors:

Panels, furniture	to match off-white walls	
Sculptures		
Air-borne	Pale Gold	Formica 882
Land-laid	Lichen	Formica 870
Sea-laid	Sage Green	NevamarS5-35T

Exhibit Signage
Nine inch plastic formed letters for wall signing are Century Bookman Bold plain cut and duranodic bronze #3130 in color. At $11.50 each, they are available from the following:
Gemini Letters
1-800-LETTERS

Nylon Vegetation
Platform vegetation is highly interpretive and made of fireproofed nylon stretched between the platform and ceiling attachments. They provide atmosphere as well as providing a soft barrier for fossils.

Typography
Bookman in bold and regular faces is the font used throughout the exhibits

16"x20", 2'x2' Panels

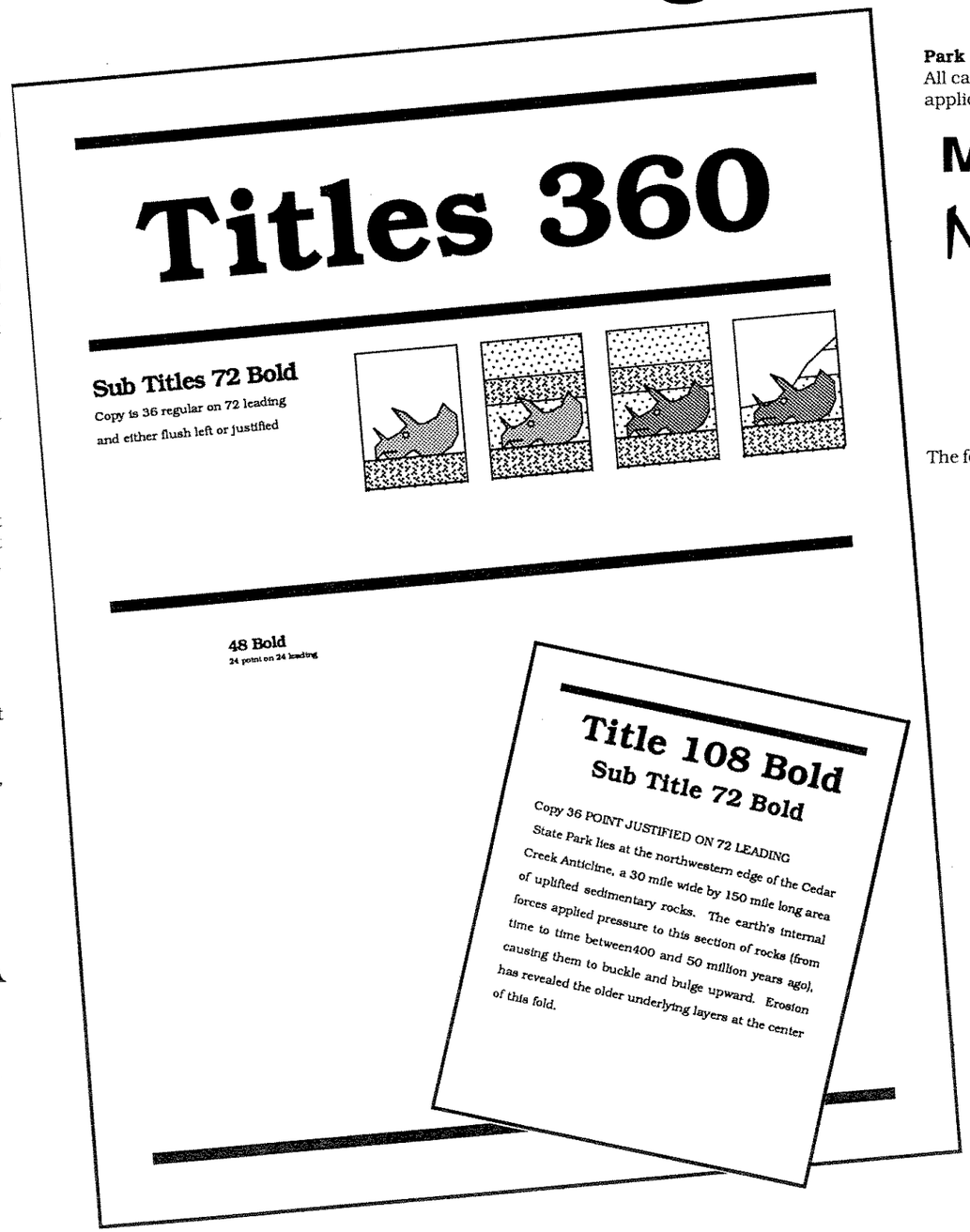
Titles	108 point bold
Sub Titles	72 point bold
Body Copy	36 point regular on 72 point leading, justified or flush left
Captions	24 point regular on 24 lead, flush left

3'x4', 4'x4', 6'x4' Panels

Titles	360 point bold
Sub Titles	144 point bold
Copy Titles	72 point bold
Body Copy	36 point regular on 72 point leading, justified
Caption Title	48 point bold
Captions	24 point regular on 24 lead, flush left

A A A A

106 72 36 24



Park Identity
All capital, sans-serif letter styles are preferred for applications calling for a spelled identity:

MAKOSHIKA

MAKOSHIKA

The following preliminaries are offered for the logo:

Costs & Resources

This information on costs and resources is provided to facilitate the exhibit development process. All prices should be confirmed by the vendors.

Art
Exhibit Panel Art: individually screened artwork on panels is generally of one color, though several colors may be used on a panel. Other artwork is to be line art, screened over a flat color block.

Henderson Pastels:
The reason for a pictorial representation of the paleo-environments is to provide a sense of the environment without incurring the cost of developing a detailed wall mural. My preference for Doug Henderson's work is based on the quality, affordability and ease of working with this artist. He is experienced with both dinosaurs and paleo-environments. The value of his illustrations is escalating with originals having jumped from $600 to $2,000 dollars in the past few years. A custom 22"x29" pastel (framed out at 30"x40" will cost about $1,000 each. Using an existing illustration as a photo reproduction would require a one time use fee of $200. Doug prefers to hold the copyright on all of his work, but is generous in allowing publication permissions for educational endeavors. He would probably allow free use of the images commissioned by the Park for educational publications and ask a 5% royalty for commercial applications like postcards that might be very useful to the Park's sales shop (6% is the standard royalty rate). He can be reached at:

Doug Henderson
17 Makowski Lane
PO Box 368
Whitehall, Montana 59759
406 287-3731

Compression Uplifter
This custom constructed interactive employs layers of carpet that buckle when compressed. Handles allow the visitor to move sleds together along a track. Gravity returns the sleds and carpet to their original position.

Flappers
Flexible PVC sheeting (grocery store cold section hanging strip material) requires vinyl silkscreen ink. That is the bad news. The good news is that PVC cement bonds the handle to the flapper cover permanently. These materials are proven as low maintenance flappers. Three separate panels employ flappers:

Seaway Sediments
Terrible Lizards
Fine Points

An opaque "flapper" lifts to reveal either a screened illustration or a window framing artifacts such as projectile points or fossils.

Fossils
Purchasing fossils may subject the state to criticism for supporting an industry with questionable ethics. Legislation is under consideration regarding fossil collection. The best course of action is to arrange for Diane Gabriel or Jack Horner to collect for the exhibition. They are in the field on other research and adding the needs of this exhibit may prove an easier and more ethical means of obtaining specimen. Fossils, however can be purchased from a number of sources:

Geological Enterprises, Inc.
Box 996
Ardmore, Oklahoma 73402
405 223-8537

Reproductions (casts and recreations) are also available:

Peter May
Toronto, Canada
416 849-0155

David Rishim (Dino Tracks)
Texas State Parks & Wiuldlife
512 389-4800

Mid-land Scientific Service
1157 Behnfeldt Road
Bryan, Ohio 43506
419 636-0444

Jim Matson
Utah
801 272-2409

Chase Studios
Star Route 3
Box 133
Cedar Creek, Missouri 65627
417 794-3762

Smith Studios
34294 Frontage Road
Bozeman, Montana 59715
406 586-4296

Letters
Nine inch plastic formed letters for wall signing are Century Bookman Bold plain cut and duranodic bronze #3130 in color. At $11.50 each, they are available from the following:

Gemini Letters
1-800-LETTERS

Mannequins
Quality full body mannequins are available from the following:

North Light Sculpture Studios
133 West Pittsburg Street
Milwaukee, Wisconsin 53204
414 273-0898
Cost is about $10,000

Chase Studios
Star Route 3
Box 133
Cedar Creek, Missouri 65627
417 794-3762

Museums with cast mannequin displays will occassionally sell a copy to recoup expenses.

Murals
Wall murals are to be simplified silhouette versions of the Henderson Pastel illustration. Art will need to be developed after the commission of the framed art. Final color specification will also need to wait for the commissioned art. Projection by slide or overhead projector on to the wall will be required. Standard latex acrylic interior house paint with matte texture should be used. Sherwin Williams colors are specified.

Photographs:
Diane Gabriel and Dr. Les Davis have generously offered slide images for inclusion in the exhibition. They can be reached at the following address:

Museum of the Rockies
600 W. Kagy Blvd.
Bozeman, Montana 59717
406 994-2251

Color photographs need to be Cibachromes for longevity.

Sculptures
Sea-laid, land-laid and air-borne sediment colored laminates over .75 inch plywood base support custon made sculpture tops:

Frank Tose
10600 Bridger Canyon
Bozeman, MT 59715
406 586-0421

Chase Studios
Star Route 3
Box 133
Cedar Creek, Missouri 65627
417 794-3762

Sediments
In general, air-borne, land-laid and sea-laid terms replace the use of specific sediment identities. Likewise, geological terms and periods are replaced by generic terms where possible.

Dr. David Fastovsky possibly can provide information regarding the sediments showing on the surface at the current time:

Dr. David Fastovsky
Geology Department
University of Rhode Island
Providence, Rhode Island

Sediment Spinner
A successful version of this interactive has been used at the Tyrrell Museum for several years. They should be contacted during the development of working drawings in the next phase. It is basically a circular reservoir attached vertically on a turn table with internal plates that stir the three sizes of sediments when the visitor sets it in motion. All sizes of sediments are made from a single type of material. Dow Corning #200-Fluid (20 CST) is a silicon with the same viscosity and appearance as water. It is extremely slippery in terms of escape, but it will not mildew or support other forms of low life.

Soil Eroder
A Made-in-Montana coffee table novelty has application in the exhibits when mounted on a turn-table allowing visitors to rotate the unit upside down and start the erosion of sediments to the bottom of the frame.